MEDICINAL PLANTS

BEING

DESCRIPTIONS WITH ORIGINAL FIGURES

OF THE

PRINCIPAL PLANTS EMPLOYED IN MEDICINE

AND AN ACCOUNT OF THE

CHARACTERS, PROPERTIES, AND USES OF THEIR PARTS AND PRODUCTS OF MEDICINAL VALUE.

BY

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THE PLATES BY DAVID BLAIR, F.L.S.

IN FOUR VOLUMES

VOL. I (Nos. 1—69)

RANUNCULACEÆ to ANACARDIACEÆ

LONDON

J. & A. CHURCHILL, NEW BURLINGTON STREET

1880

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PREFACE

The following systematic account of the most important plants used in medicine has been issued in forty-two parts, and has occupied over four years in its publication. The order in which the species are numbered and now arranged in accordance with botanical system affords no clue to the actual sequence in which they were published; this was determined wholly by circumstances, such as a species happening to flower in one of the botanic gardens, which enabled at any particular time a figure and description to be made. In the use of the book it is important to remember this, or the authors might be thought to have neglected in some cases recent information.

As must always be the case in a book published in this manner, some inequalities of treatment will doubtless be observed, and are, indeed, unavoidable. Some plants may appear to have been treated at undue length, whilst others have been comparatively neglected; but it will be found that such differences have resulted from the varying interest taken in substances at different times, some new remedies especially exciting much attention, and thus demanding a full description, though perhaps not of great permanent value. In fact, each article must to a considerable extent be considered as independent of the rest, but the authors believe that no researches of importance have been overlooked, and that the bibliographical quotations have been brought fully up to date.

The work was originally designed to serve more especially as an illustrated botanical guide to the *British Pharmacopœia*, the *Pharmacopœia of India*, and the *Pharmacopœia of the United States of America*. All the plants referred to in the former volume have,

therefore, been figured and described; as also all mentioned in the Primary List, and many of those in the Secondary List, of the Materia Medica of the Pharmacopœia of the United States; and with a very few exceptions all the official plants of the Pharmacopœia of India. It also includes other species in common medicinal use, though not official in this country; some which afford food substances, of value chiefly to invalids; and a few of our most poisonous indigenous plants.

The number of species figured is 306, but many more are alluded to in the text. A systematic list of the plants figured and described is given at the commencement of the book, from which it is seen that they represent 89 natural families and 233 genera, thus affording examples of all the parts of the vegetable kingdom. The species which are natives of the British Isles are indicated in the list by an asterisk. They are 67 in number.

It will be observed that the text of each plant is divided into two portions; the first devoted to the description of the species, its localities, and other purely botanical matter; the second to the general characters, composition, properties, and uses of its parts or products which are employed in medicine or otherwise. The work being thus of a too comprehensive character for one author, Professor Bentley, who originally designed it, was glad to obtain the co-operation of Dr. Trimen, who undertook the first portion, Professor Bentley reserving to himself the latter. A few words of explanation of the plan followed in each section seem to be required.

At the head of the page in small type is the name of the *Natural Order,* with a reference to one or more of the standard books on general systematic botany;* and then the name of the *Genus,* with similar quotations of the best general works which give full generic descriptions.† The *name* of the species is

* Lindley's Vegetable Kingdom, 3rd edition, London, 1853. Le Maout and Decaisne's Traité Générale de Botanique, translated by Mrs. Hooker, London, 1873. Baillon's Histoire des Plantes, in six vols., Paris, 1870–79, and in progress.

† These are for the earlier natural orders Bentham and Hooker, *fil.*,

printed in large, bold type, and is followed by the authority, fully quoted, with the date. This is not the place to enter into any discussion on botanical nomenclature, but it may be noted that the modern binominal system was invented by Linnæus in the year 1753, which is thus the earliest date which any such name can possibly have, though, of course, the great majority of the plants he described were well known before that time, and not unfrequently under names which Linnæus adopted.

The English, American, or Native names are given in the next line.

Under the heading *Syn.* there are printed some selected synonyms. Most species have had the misfortune to receive more than one name, a result of different views held either as to the limits of genera or of species, as well as of ignorance of the existence of a previous name. Hence some synonyms are strictly so, *i.e.* duplicate names or aliases, whilst others represent varieties or forms which have been separated as species and named by their authors.

In footnotes are given the derivation, so far as can be ascertained, of the generic, and when necessary, the specific, name. When these are classical Greek or Latin words it has not been attempted to trace them further back, but in the case of mediæval and modern names, the origin and meaning are given.

The next paragraph is devoted to the quotation of *Figures* of the plant. It was thought desirable to give these somewhat largely, and especially to quote the principal 'Medical Botanies' of this and other countries to which we had access. The following is a list of the books devoted to the illustration of medicinal plants which are systematically quoted in the pages of this work :

Woodville.—Medical Botany. By William Woodville, M.D. In 4 vols. London, vol. i, 1790, vol. ii, 1792, vol. iii, 1793, vol. iv, 1794 [Tab. 274]. *Edition* 2.—London, 1805—1810 [a reissue, with the plates differently numbered]. *Edition* 3.—Edited by W. J. Hooker and G. Spratt. London, 1832. In 5 vols. [vols. i—iv, a second reissue of the plates with the new

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Genera Plantarum, vol. i, 1862–67, vol. ii, 1873–76, and Baillon's work already referred to; and for the later portions De Candolle's Prodromus, Kunth's Enumeratio Plantarum, and some special treatises.

numbering, vol. v, 39 additional plates not numbered]. We quote the last edition.

Hayne.—Getreue Darstellung und Beschreibung der in der arzneykunde Gebräuchlichen Gewächse. Von F. G. Hayne. In 14 vols. Vol. i, 1805, vol. ii, 1809, vol. iii, 1813, vol. iv, 1816, vol. v, 1817, vol. vi, 1819, vol. vii, 1821, vol. viii, 1822, vol. ix, 1825, vol. x, 1827, vol. xi, 1830, vol. xii, 1833, vol. xiii, 1837, vol. xiv, von F. Klotzsch, 1846 [Tab. col. 648].

Barton.—Vegetable Materia Medica of the United States. By W. P. C. Barton. In 2 vols. Philadelphia, vol. i, 1817, vol. ii, 1818 [Tab. col. 50].

Bigelow.—American Medical Botany. By J. Bigelow. In 3 vols. Boston, vol. i, 1817, vol. ii, 1818, vol. iii, 1820 [Tab. col. 60].

Stephenson & Churchill.—Medical Botany. By J. Stephenson and J. M. Churchill. In 4 vols. London, 1831. [So dated, but published from January, 1827, to November, 1830. Tab. col. 185.] *Edition* 2.—Edited by G. T. Burnett. London, 1834—36 [a reissue of the plates].

Nees.—Plantæ Medicinales, oder Beschreibung officineller Pflanzen. Dr. T. F. L. Nees von Esenbeck, M. F. Weyhe, J. W. Woltor, and P. W. Funke. In 2 vols. Düsseldorf, 1828, 1829 [Tab. col. 432]. *Supplement.*—Erste Supplement-band. In 2 vols. Düsseldorf, 1833 [Tab. col. 120].

Berg & Schmidt.—Darstellung und Beschreibung sämmtlicher in der Pharmacopœia Borussica aufgeführten officinellen Gewächse. Von O. C. Berg and C. F. Schmidt. In 4 vols. Leipzig, 1858—1863 [Tab. col. 204].

The figures in these standard works are always quoted, and it has been an endeavour to trace back to their original source such of them as were copies. But, besides these, figures of merit from all sources are referred to, especially those of modern books. To give a list of the titles of such books here would be impossible from their number, but it is hoped they will be readily identified by their abridged titles.

The *description* of the plant, which follows, has been written in somewhat full detail, and in strictly scientific but not very technical language, presupposing some knowledge of botanical science in the reader. In the great majority of cases the descriptions were freshly made from actual living or dried specimens, and it must be borne in mind that they apply to the living plant, and not to the drug prepared for the market.

Details of microscopic structure are not given, as such characters are not included in the objects of the work.

Under the heading *habitat* is embodied all necessary information relating to geographical distribution, cultivation, time of flowering, varieties, &c., as well as, in special cases, some account of the discovery of the species and its determination as the source of the drug under consideration. Notes on allied species, on nomenclature, on special or noteworthy points of structure, &c., also fall under this section, which is concluded by a citation of the books and papers, chiefly Floras of various countries, in which further detail as to distribution, culture, or peculiarities, may be obtained.

In the *second* portion of the text the parts or products which are official in one or more of the three pharmacopœias specially illustrated are first mentioned, together with their pharmaceutical and common names; or, in the case of plants not recognised in either of these pharmacopœias, reference is made to the parts which are in use, together with their scientific and ordinary names.

Then follows, when necessary, some notice of the *Collection*, *Preparation*, and *Commerce* of the drug or substance treated of; but in other cases its general description and composition immediately succeed. With respect to the general description of the drug great care and attention have been given, and it is hoped and believed that the full details will prove to be of especial value to pharmacists and others, who are constantly called upon to deal with the drugs of vegetable origin. In that part relating to *Chemical Composition* it has not been deemed necessary, or, in fact, coming within the objects of the work, to do more than briefly refer to those constituents in which the properties of the drug reside, or which are regarded as the most important. For full details in this respect reference should be made to special works on chemistry and materia medica.

In numerous instances the latter section is succeeded by some observations on *Adulterations* and *Substitutions*, and although from the nature and necessary limits of the work it has been found impossible to go fully into these matters, it is believed that all is contained that is essential, and that the very full description

previously given of the characters of the drug will be sufficient to make clear the distinctions between the true and the spurious, and to render it easy to detect adulteration.

The last section, which is devoted to *Medicinal Properties* and *Uses*, is of special importance to the practitioner of medicine; and here great care and much discrimination have been exercised to give as full a summary as possible of those diseases in which the drug has been found of more especial value, as well as those in which it has been regarded as useful; and also those in which it seemed worthy of a more extended trial than it has hitherto received in this country. In the case of some new remedies, more particularly those introduced from the United States of America and India, it is believed by the authors that much benefit will arise from their more general use. The medicinal properties and uses of drugs have been supplemented in all cases when necessary, by some notice of the economic uses of the plant described; but the authors have here been obliged to confine themselves to a brief account of the more important applications, as not falling further under their province.

It has been the authors' aim to compress under each section all the most recent information, and the very numerous bibliographical list of quotations given at the end will show that no pains have been spared in this respect; and they also confidently believe that this list of authors will be of the greatest value to those who are desirous of more fully investigating, or of becoming further acquainted with drugs of vegetable origin. It is desirable, however, to mention more prominently those works which have been more generally referred to in the second portion of the text of each article. They are as follows:

British Pharmacopœia. Published under the direction of the General Council of Medical Education and Registration of the United Kingdom. London, 1867. Together with the Additions, published by the same Authority in 1874.

Pharmacopœia of India. Published under the Authority of Her Majesty's Secretary of State for India in Council. By Edward John Waring, M.D.. London, 1868.

Pharmacopœia of the United States of America. Fifth Decennial Revision.

Published by Authority of the National Convention for Revising the Pharmacopœia, held at Washington, 1870. Philadelphia, 1875.

The Elements of Materia Medica and Therapeutics. By Jonathan Pereira, M.D., F.R.S. Fourth Edition. Edited by A. S. Taylor and G. O. Rees. London, vol. ii, part 1, 1855, and vol. ii, part 2, 1857. *Abridged Edition*, 1872, and *Appendix*, 1874. Edited by R. Bentley and T. Redwood.

Pharmacographia. A History of the Principal Drugs of Vegetable Origin met with in Great Britain and British India. By F. A. Flückiger, Phil. Dr., and Daniel Hanbury, F.R.S. London, 1874.

The Dispensatory of the United States of America. By G. B. Wood, M.D., and F. Bache, M.D. Thirteenth Edition. Philadelphia, 1875.

Therapeutics and Materia Medica. By Alfred Stillé, M.D. Second Edition, 1864, and Subsequent Editions. Philadelphia.

The Essentials of Materia Medica and Therapeutics. By A. B. Garrod, M.D., F.R.S. Fifth Edition. Revised and Edited under the Supervision of the Author. By E. B. Baxter, M.D. London, 1875.

Manual of Materia Medica and Therapeutics. By J. F. Royle, M.D., F.R.S. Sixth Edition. By John Harley, M.D. London, 1876.

Pharmaceutical Journal. First Series, vols. i—xviii. Edited by Jacob Bell. London, 1842–59. 2nd Series, vols. i—xi. London, 1859–70. And 3rd Series, vols. i —x. London, 1870–9.

Proceedings of the American Pharmaceutical Association. Vols. i—xxvi, Philadelphia, 1850–79.

Year Book of Pharmacy and Transactions of the British Pharmaceutical Conference. London, 1870–79.

At the conclusion of the text of each plant a description of the plate is given, and in every case the source whence the specimen figured was obtained; and the authors here beg to tender their thanks to the numerous gentlemen who have either given or lent specimens for this purpose, or have permitted the artist access to the public collections under their charge. Without such kind co-operation the work could not have been carried out in a satisfactory manner.

With regard to the plates themselves the authors are aware that they are unequal in merit and occasionally faulty. They will, however, be found to contain a great many structural details which in the large majority of cases have the advantage of being original. It must be remembered that in the case of many rare plants the material at the disposal of the artist was very scanty; when, however, he has had to reproduce figures from other works the source is always distinctly stated.

London: *February* 1, 1880.

SYSTEMATIC LIST OF CONTENTS.

VOL. I.—NOS. 1 TO 69.—RANUNCULACEÆ TO ANACARDIACEÆ.

PHANEROGAMIA.

DICOTYLEDONES.

Angiospermæ.

Polypetalæ.

RANUNCULACEÆ.

1. Hydrastis canadensis, *Linn.*
   Hydrastis.
2. Helleborus niger, *Linn.*
   Helleborus.
3. Coptis trifolia, *Salisb.*
   Coptis.
   Other Official Species of Coptis.
4. Delphinium Staphisagria, *Linn.*
   Staphysagriæ Semina.
   Delphinium Consolida
   Delphinium.
5. Aconitum ferox, *Wall.*
   Aconiti Ferocis Radix.

*6. A Napellus, *Linn.*
   1. *Aconiti Folia.*
   2. *Aconiti Radix.*
   3. *Aconitia* or *Aconitine.*

7. A. heterophyllum, *Wall.*
   Aconiti Heterophylli Radix.
8. Cimicifuga racemosa, *Elliott.*
   Cimicifuga.
9. Xanthorhiza apiifolia, *L'Herit.*
   Xanthorrhiza.

MAGNOLIACEÆ.

10. Illicium anisatum, *Linn.*
    1. *The Fruit.*
    2. *Oleum Anisi.*

MENISPERMACEÆ.

11. Chondrodendron tomentosum, *R. & P.*
    Pareiræ Radix (*Pareira*).
12. Tinospora cordifolia, *Miers.*
    Tinosporæ Radix et Caules.
13. Jateorhiza Calumba, *Miers.*
    Calumbæ Radix (*Calumbæ*).
14. Anamirta paniculata, *Colebr.*
    Cocculus Indicus.
15. Cissampelos Pareira, *Linn.*
    Pareiræ Radix (*Pareira*).

BERBERIDEÆ.

16. Berberis aristata, *DC.*
    Berberis Cortex.
    Other Official Species of Berberis.
17. Podophyllum peltatum, *Linn.*
    1. *Podophylli Radix* (*Podophyllum.*)
    2. *Podophylli Resina.*

PAPAVERACEÆ.

*18. Papaver somniferum, *Linn.*
    1. *Papaveris Capsulæ* (*Papaver*).
    2. *Opium.*

*19. P. Rhœas, *Linn.*
    Rhœados Petala.

20. Sanguinaria canadensis, *Linn.*
    Sanguinaria.

CRUCIFERÆ.

*21. Cochlearia Armoracia, *Linn.*
    Armoraciæ Radix.

*22. Brassica nigra, *Koch.*
    1. *Sinapis* (*Sinapis Nigra*).
    2. *Oleum Sinapis.*

CRUCIFERÆ (*continued*)
*23. Brassica alba, *Hk. f. & Th.*
Sinapis Alba.
Sinapis.

CISTACEÆ.
24. Cistus creticus, *Linn.*
Labdanum.

VIOLACEÆ.
*25. Viola odorata, *Linn.*
Viola.

CANELLACEÆ.
26. Canella alba, *Murr.*
Canellæ Albæ Cortex (*Canella*).
27. Cinnamodendron corticosum, *Miers.*
Cinnamodendron.

BIXACEÆ.
28. Gynocardia odorata, *R. Br.*
Gynocardiæ Semina.

POLYGALACEÆ.
29. Polygala Senega, *Linn.*
Senegæ Radix (*Senega*).
30. Krameria triandra, *R. & P.*
Krameriæ Radix (*Krameria*).
31. K. Ixina, *Linn.*
Ratanhia Granatensis.
Other Kinds of Rhatany.

GUTTIFERÆ
32. Garcinia indica, *Chois.*
Garciniæ purpureæ Oleum.
Other Products.
33. G. Hanburii, *Hk. f.*
Cambogia.
Other Sources of Gamboge.

TERNSTROEMIACEÆ.
34. Camellia Thea, *Link.*
Thea (*Tea*).

MALVACEÆ.
*35. Althæa officinalis, *Linn.*
Althæa.
36. Hibiscus esculentus, *Linn.*
Hibisci Capsulæ.
Other Products.
37. Gossypium barbadense, *Linn.*
1. *Gossypium.*
2. *Gossypii Radicis Cortex.*

STERCULIACEÆ.
38. Theobroma Cacao, *Linn.*
Oleum Theobromæ.
Cocoa or Cacao Seeds.

LINACEÆ.
*39. Linum usitatissimum, *Linn.*
1. *Lini Semina* (*Linum*).
2. *Lini Farina.*
3. *Oleum Lini.*
4. *Other Products.*
40. Erythroxylon Coca, *Lam.*
Coca.

ZYGOPHYLLACEÆ.
41. Guaiacum officinale, *Linn.*
1. *Guaiaci Lignum.*
2. *Guaiaci Resina.*

GERANIACEÆ.
42. Geranium maculatum, *Linn.*
Geranium.

RUTACEÆ.
43. Galipea Cusparia, *St. Hil.*
Cuspariæ Cortex (*Angustura*).
44. Ruta graveolens, *Linn.*
1. *Ruta.*
2. *Oleum Rutæ.*
45. Barosma betulina, *Bartl. & Wendl.*
Buchu Folia.
46. B. crenulata, *Hook.*
Buchu Folia.
47. B. serratifolia, *Willd.*
Buchu Folia.
48. Pilocarpus pennatifolius, *Lemaire.*
Jaborandi.
49. Toddalia aculeata, *Pers.*
Toddaliæ Radix.
50. Citrus vulgaris, *Risso.*
1. *Aurantii Fructus.*
2. *Aurantii Cortex* (*Aurantii Amari Cortex*).
3. *Aqua Aurantii Floris.*
51. C. Aurantium, *Riss.*
1. *Aurantii Flores.*
2. *Aurantii Dulcis Cortex.*
3. *Other Products.*

RUTACEÆ (*continued*)
52. Citrus Bergamia, *Riss. & Poit.*
1. *Limettæ Fructus Succus.*
2. *Oleum Bergamii.*
53. C. medica, *Riss.*
Cortex Citri Medicæ.
54. C. Limonum, *Riss.*
1. *Limonis Cortex.*
2. *Oleum Limonis.*
3. *Limonis Succus.*
55. Ægle Marmelos, *Corr.*
Belæ Fructus.
Other Products.
SIMARUBACEÆ.
56. Simarouba amara, *Aubl.*
Simaruba.
57. Picræna excelsa, *Lindl.*
Quassiæ Lignum (*Quassia*).
BURSERACEÆ.
58. Boswellia Carterii, *Birdw.*
Olibanum.
59. Balsamodendrum Opobalsamum, *Kunth.*
Myrrh.
Balm of Gilead.
Stacte or Liquid Myrrh.
60. B. Myrrha, *Nees.*
Myrrha.

BURSERACEÆ (*continued*)
61. Canarium commune, *Linn.*
Elemi.
Other Uses of Canarium commune.
MELIACEÆ.
62. Melia Azadirachta, *Linn.*
1. *Azadirachtæ Cortex.*
2. *Azadirachtæ Folia.*
3. *Other Products.*
4. *Other Official Species of Melia.*
63. Soymida febrifuga, *A. Juss.*
Soymidæ Cortex.
RHAMNACEÆ.
*64. Rhamnus catharticus, *Linn.*
Rhamni Succus.
*65. R. Frangula, *Linn.*
Rhamni Frangulæ Cortex.
AMPELIDEÆ.
66. Vitis vinifera, *Linn.*
Uvæ (*Uva Passa*).
SAPINDACEÆ.
67. Paullinia sorbilis, *Mart.*
Guarana.
ANACARDIACEÆ.
68. Pistacia Lentiscus, *Linn.*
Mastiche.
69. P. Terebinthus, *Linn.*
Terebinthina Chia.

VOL. II.—NOS. 70—146.—LEGUMINOSÆ TO VALERIANACEÆ.

LEGUMINOSÆ.
*70. Cytisus scoparius, *Linn.*
Scoparii Cacumina (*Scoparius*).
71. Trigonella Fœnum-græcum, *Linn.*
Fœni-Græci Semen.
72. Indigofera tinctoria, *Linn.*
Indigo.
73. Astragalus gummifer, *Lab.*
Tragacantha.
74. Glycyrrhiza glabra, *Linn.*
1. *Glycyrrhizæ Radix* (*Glycyrrhiza*).
2. *Extractum Glycyrrhizæ.*
75. Arachis hypogæa, *Linn.*
Oleum Arachis.
Other Uses of the Seeds.

LEGUMINOSÆ (*continued*)
76. Lens esculenta, *Moench.*
Lentis Semina.
77. Abrus precatorius, *Linn.*
Abri Radix.
Other Uses.
78. Mucuna pruriens, *DC.*
Mucuna.
79. Butea frondosa, *Koen.*
Buteæ Gummi (*Kino Bengalensis*).
Other Products.
80. Physostigma venenosum, *Balf.*
Physostigmatis Faba (*Physostigma*).
81. Pterocarpus Marsupium, *Roxb.*
Kino.

LEGUMINOSÆ (*continued*)
82. Pterocarpus santalinus, *Linn. f.*
Pterocarpi Lignum (*Santalum*).
(*Lignum Santalinum rubrum.*)
83. Toluifera Pereiræ, *Baill.*
Balsamum Peruvianum.
Other Products.
84. T. Balsamum, *Linn.*
Balsamum Tolutanum,
85. Cæsalpinia Bonducella, *Roxb.*
Bonducellæ Semina.
86. Hæmatoxylon campechianum, *Linn.*
Hæmatoxylon Lignum (*Hæmatoxylon*).
87. Cassia Fistula, *Linn.*
1. *Cassia Fistula.*
2. *Cassiæ Pulpa.*
88. C. marilandica, *Linn.*
Cassia marilandica.
89. C. obovata, *Collad.*
Senna Alexandrina (*Senna*).
Senna from Cassia obovata.
90. C. acutifolia, *Del.*
Senna Alexandrina (*Senna*).
91. C. angustifolia, *Vahl.*
Senna Indica (*Senna*).
92. Tamarindus indica, *Linn.*
Tamarindus.
93. Copaifera Langsdorffii.
Copaiba.
94. Acacia Senegal, *Willd.*
Acaciæ Gummi (*Acacia*).
95. A. Catechu, *Willd.*
Catechu Nigrum (*Catechu*).

ROSACEÆ.
*96. Prunus domestica, *Linn.*, var. *Juliana, DC.*
Prunum.
97. P. serotina, *Ehrh.*
Prunus Virginiana.
98. P. Laurocerasus, *Linn.*
Laurocerasi Folia.
99. P. Amygdalus, *Stokes.*
1. *Amygdalæ Dulces.*
2. *Amygdalæ Amaræ.*
3. *Oleum Amygdalæ.*
4. *Oleum Amygdalæ Amaræ.*

ROSACEÆ (*continued*)
100. Rubus villosus, *Ait.*
Rubus.
*101. Potentilla Tormentilla, *Stokes.*
Tormentilla.
102. Hagenia abyssinica, *Willd.*
Cusso (*Brayera*).
*103. Rosa canina, *Linn.*
Rosa Caninæ Fructus.
104. R. gallica, *Linn.*
Rosæ Gallicæ Petala (*Rosæ Gallicæ Flores*).
105. R. centifolia, *Linn.*
1. *Rosa Centifoliæ Petala* (*Rosa Centifolia*).
2. *Oleum Rosæ.*
106. Pyrus Cydonia, *Linn.*
Cydonium.

HAMAMELIDEÆ.
107. Liquidambar orientalis, *Mill.*
Styrax Præparatus (*Styrax*).
Other Kinds of Storax.

MYRTACEÆ.
108. Melaleuca minor, *Sm.*
Oleum Cajuputi.
109. Eucalyptus Globulus, *Lab.*
Eucalypti Folia.
Other Products and Uses.
110. Pimenta acris, *Wight.*
Spiritus Myrciæ.
111. P. officinalis, *Lind.*
1. *Pimenta.*
2. *Oleum Pimentæ.*
112. Eugenia caryophyllata, *Thunb.*
1. *Caryophyllum* (*Caryophyllus*).
2. *Oleum Caryophylli.*
3. *Other Products.*

LYTHRACEÆ.
113. Punica Granatum, *Linn.*
1. *Granati Radicis Cortex.*
2. *Granati Fructus Cortex* (*Granati Cortex*).
3. *Other Products.*

CUCURBITACEÆ.
114. Citrullus Colocynthis, *Schrad.*
Colocynthidis Pulpa (*Colocynthis*).
115. Ecballium Elaterium, *A. Rich.*
1. *Ecbalii Fructus.*
2. *Elaterium.*
116. Cucurbita Pepo, *Linn.*
Pepo.
UMBELLIFERÆ.
117. Hydrocotyle asiatica, *Linn.*
Hydrocotyles Folia.
*118. Conium maculatum, *Linn.*
1. *Conii Folia.*
2. *Conii Fructus.*
*119. Cicuta virosa, *Linn.*
Cicuta virosa.
120. Carum Ajowan, *Bentl. & Trim.*
Fructus Ptychotis.
*121. C. Carui, *Linn.*
1. *Carui Fructus* (*Carum*).
2. *Oleum Carui* (*Oleum Cari*).
122. Pimpinella Anisum, *Linn.*
1. *Anisum.*
2. *Oleum Anisi.*
*123. Fœniculum capillaceum, *Gilib.*
Fœniculi Fructus (*Fœniculum*).
*124. Œnanthe crocata, *Linn.*
Œnanthe crocata.
Properties of other Species of Œnanthe.
*125. Æthusa Cynapium, *Linn.*
Æthusa Cynapium.
126. Ferula Narthex, *Boiss.*
Assafœtida.
127. F. Scorodosma, *Bentl. & Trim.*
Assafœtida.
128. F. galbaniflua, *Boiss & Buhse.*
Galbanum.
129. F. Sumbul, *Hook. f.*
Sumbul Radix.
130. Dorema Aucheri, *Boiss.*
Ammoniacum.
131. D. Ammoniacum, *D. Don.*
Ammoniacum.
Dorema Root.
132. Peucedanum graveolens, *Hiern.*
1. *Anethi Fructus.*
2. *Oleum Anethi.*
UMBELLIFERÆ (*continued*)
*133. Coriandrum sativum, *Linn.*
1. *Coriandri Fructus* (*Coriandrum*).
2. *Oleum Coriandri.*
134. Cuminum Cyminum, *Linn.*
Cumini Fructus.
*135. Daucus Carota, *Linn.*
1. *Carota.*
2. *Dauci Radix.*

Monopetalæ or *Gamopetalæ.*

CORNACEÆ.
136. Cornus florida, *Linn.*
Cornus florida.
Other Official Species of Cornus.
CAPRIFOLIACEÆ.
*137. Sambucus nigra, *Linn.*
Sambuci Flores.
Properties and Uses of other parts of the Elder Plant.
138. S. canadensis, *Linn.*
Sambucus.
RUBIACEÆ.
139. Uncaria Gambier, *Roxb.*
Catechu Pallidum.
140. Cinchona officinalis, *Linn.*
Cinchonæ Pallidæ Cortex (*Cinchona Pallida.*)
Grey or Huanuco bark.
141. C. Calisaya, *Wedd.*
1. *Cinchonæ Flavæ Cortex* (*Cinchona Flava*).
2. *Quiniæ sulphas.*
142. C. succirubra, *Pav.*
Cinchonæ Rubræ Cortex (*Cinchona Rubra*).
143. C. cordifolia, *Mutis.*
1. *Cinchona cordifolia.*
2. *Cinchona lancifolia.*
Quiniæ Sulphas.
144. Coffea arabica, *Linn.*
Coffea.
Coffee Leaves.
145. Cephælis Ipecacuanha, *A. Rich.*
Ipecacuanha.
VALERIANACEÆ.
*146. Valeriana officinalis, *Linn.*
Valeriana Radix (*Valeriana*).

Vol. III.—Nos. 147 to 227.—Compositæ to Thymelaceæ.

Compositæ.
147. Eupatorium perfoliatum, *Linn.*
Eupatorium.
Other Medicinal Species of Eupatorium.
148. Erigeron heterophyllum, *Mühl.*
Erigeron.
*149. E. canadense, *Linn.*
Erigeron canadense.
*150. Inula Helenium, *Linn.*
Inula.
151. Anacyclus Pyrethrum, *DC.*
Pyrethri Radix (*Pyrethrum*).
152. A. officinarum, *Hayne.*
Pyrethri Germanici Radix.
*153. Achillea Millefolium, *Linn.*
Achillea.
*154. Anthemis nobilis, *Linn.*
1. *Anthemidis Flores* (*Anthemis*).
2. *Oleum Anthemidis.*
*155. Matricaria Chamomilla, *Linn.*
Matricaria.
*156. Artemisia Absinthium, *Linn.*
Absinthium.
157. A. pauciflora, *Weber.*
1. *Santonica.*
2. *Santoninum.*
3. *Other Varieties of Santonica.*
158. Arnica montana, *Linn.*
1. *Arnicæ Radix.*
2. *Arnica* (*The Flowers*).
*159. Taraxacum officinale, *Wigg.*
Taraxaci Radix (*Taraxacum*).
*160. Lactuca virosa, *Linn.*
Lactuca.
161. L. sativa, *Linn.*
Lactucarium.

Lobeliaceæ.
162. Lobelia inflata, *Linn.*
Lobelia.

Ericaceæ.
163. Arctostaphylos Uva-ursi, *Spreng.*
Uvæ Ursi Folia (*Uva Ursi*).
164. Gaultheria procumbens, *Linn.*
Gaultheria.

Ericaceæ (*continued*)
165. Chimaphila corymbosa, *Pursh.*
Chimaphila.

Plumbagineæ.
166. Statice caroliniana, *Walt.*
Statice.
Uses of other Species of Statice.

Sapotaceæ.
167. Dichopsis Gutta, *Bentl. & Trim.*
Gutta Percha.

Ebenaceæ.
168. Diospyros Embryopteris, *Pers.*
Diospyri Fructus.
Diospyros virginiana.
Diospyros.

Styraceæ.
169. Styrax Benzoin, *Dryand.*
Benzoinum.

Oleaceæ.
170. Fraxinus Ornus, *Linn.*
Manna.
*171. F. excelsior, *Linn.*
Manna.
172. Olea europæa, *Linn.*
1. *Oleum Olivæ.*
2. *Other Products.*

Apocynaceæ.
173. Alstonia scholaris, *R. Br.*
Alstoniæ Cortex.

Asclepiadeæ.
174. Hemidesmus indicus, *R. Br.*
Hemidesmi Radix.
175. Solenostemma Argel, *Hayne.*
Argel.
176. Calotropis procera, *R. Br.*
Calotropis Cortex.
177. Tylophora asthmatica, *W. & A.*
Tylophoræ Folia.

Loganiaceæ.
178. Strychnos Nux vomica, *Linn.*
1. *Nux Vomica.*
2. *Strychnia* or *Strychnine.*
3. *Other Products.*

LOGANIACEÆ (*continued*)
179. Strychnos Ignatii, *Bergius.*
Ignatia.
180. Spigelia marilandica, *Linn.*
Spigelia.
181. Gelsemium nitidum, *Mich.*
Gelsemium.
GENTIANACEÆ.
182. Gentiana lutea, *Linn.*
Gentiana Radix (*Gentiana*).
Gentiana Catesbæi.
183. Ophelia Chirata, *Griesb.*
Chirata (*Chiretta*).
*184. Menyanthes trifoliata, *Linn.*
Menyanthes.
CONVOLVULACEÆ.
185. Ipomœa Nil, *Roth.*
Pharbitis Semina.
186. Exogonium Purga, *Benth.*
Jalapa.
187. Convolvulus, Scammonia, *Linn.*
1. *Scammoniæ Radix.*
2. *Scammoniæ Resina.*
3. *Scammonium.*
SOLANACEÆ.
188. Capsicum fastigiatum, *Blume,*
Capsici Fructus (*Capsicum*).
189. C. annuum, *Linn.*
Capsicum.
*190. Solanum Dulcamara, *Linn.*
Dulcamara.
191. Nicotiana Tabacum, *Linn.*
Tabaci Folia (*Tabacum*).
*192. Datura Stramonium, *Linn.*
1. *Stramonii Folia.*
2. *Stramonii Semina.*
*193. Atropa Belladonna, *Linn.*
1. *Belladonnæ Folia.*
2. *Belladonnæ Radix.*
3. *Atropia or Atropine.*
*194. Hyoscyamus niger, *Linn.*
1. *Hyoscyami Folia.*
2. *Hyoscyami Semen.*
SCROPHULARIACEÆ.
*195. Digitalis purpurea, *Linn.*
Digitalis Folia (*Digitalis*).
196. Veronica virginica, *Linn.*
Leptandra.
ACANTHACEÆ.
197. Andrographis paniculata, *Nees.*
Andrographis Caules et Radix.
PEDALIACEÆ.
198. Sesamum indicum, *Linn.*
1. *Sesamum.*
2. *Oleum Sesami.*
3. *Other Uses of the Seeds.*
LABIATÆ.
199. Lavandula vera, *DC.*
1. *Lavandula.*
2. *Oleum Lavandulæ.*
200. Hedeoma pulegioides, *Pers.*
Hedeoma.
*201. Mentha Pulegium, *Linn.*
Pulegium.
*202. M. viridis, *Linn.*
Oleum Menthæ Viridis.
*203. M. piperita, *Sm.*
Oleum Menthæ Piperita.
*204. Origanum vulgare, *Linn.*
Origanum.
205. Thymus vulgaris, *Linn.*
Oleum Thymi.
206. Salvia officinalis, *Linn.*
Salvia.
207. Rosmarinus officinalis, *Linn.*
1. *Rosmarinus.*
2. *Oleum Rosmarini.*
208. Monarda punctata, *Linn.*
Monarda.
*209. Nepeta Cataria, *Linn.*
Cataria.
*210. Marrubium vulgare, *Linn.*
Marrubium.
PLANTAGINEÆ.
211. Plantago Ispaghula, *Roxb.*
Ispaghulæ Semina.

Apetalæ or *Incompletæ.*

POLYGONACEÆ.
*212. Polygonum Bistorta.
Bistortæ Radix.
213. Rheum officinale, *Baill.*
Rhei Radix (*Rheum*).
214. R. palmatum, *Linn.*
Rhei Radix (*Rheum*).
215. R. Rhaponticum, *Linn.*
Rhei Anglici Radix.

SALSOLACEÆ.
216. Chenopodium anthelminticum, *Linn.*
Chenopodium.

MONIMIACEÆ.
217. Peumus Boldus, *Molina.*
Boldoæ Folia.

MYRISTICACEÆ.
218. Myristica fragrans, *Houtt.*
1. *Myristica.*
2. *Oleum Myristiceæ.*
3. *Oleum Myristicæ Expressum.*
4. *Macis.*

LAURACEÆ.
219. Nectandra Rodiæi, *Schomb.*
1. *Nectandræ Cortex* (*Nectandra*).
2. *Sulphate of Beberia.*
3. *Other Uses.*
220. Sassafras officinale, *Nees.*
1. *Sassafras Radix* (*Sassafras*).
2. *Sassafras Medulla.*

LAURACEÆ (*continued*)
221. Laurus nobilis, *Linn.*
1. *The Fruit* (*Lauri Fructus*).
2. *The Leaves* (*Lauri Folia*).
222. Cinnamomum Camphora, *Nees & Eberm.*
Camphora.
1. *Crude Camphor.*
2. *Refined Camphor.*
Other Kinds of Camphor.
223. C. Cassia, *Blume.*
Cinnamomum.
224. C. zeylanicum, *Blume.*
Cinnamomi Cortex (*Cinnamomum*).
Oleum Cinnamomi.

THYMELACEÆ.
*225. Daphne Mezereum, *Linn.*
Mezerei Cortex (*Mezereum*).
*226. D. Laureola, *Linn.*
Mezerei Cortex (*Mezereum*).
227. D. Gnidium, *Linn.*
Mezereum.

VOL. IV.—NOS. 228 TO 306.—ARTOCARPACEÆ TO ALGÆ.

ARTOCARPACÆ.
228. Ficus Carica, *Linn.*
Ficus.
229. Morus nigra, *Linn.*
Mori Succus.
Other Uses.

CANNABINEÆ.
*230. Humulus Lupulus, *Linn.*
1. *Lupulus* (*Humulus*).
2. *Lupulina.*
*231. Cannabis sativa, *Linn.*
Cannabis Indica.

ULMACEÆ.
*232. Ulmus campestris, *Linn.*
Ulmi Cortex.
233. U. fulva, *Mich.*
Ulmus.

SALICINEÆ.
*234. Salix alba, *Linn.*
Salix.

EUPHORBIACEÆ.
235. Manihot utilissima, *Pohl.*
1. *General Characters and Products of the Roots.*
2. *Cassava Starch or Tapioca Meal.*
236. Mallotus philippinensis, *Müll. Arg.*
Kamala (*Rottlera*).
237. Ricinus communis, *Linn.*
1. *The Seeds* (*Ricini Semina*).
2. *Oleum Ricini.*
238. Croton Eluteria, *J. Benn.*
Cascarillæ Cortex (*Cascarilla*).
239. C. Tiglium, *Linn.*
Oleum Crotonis (*Oleum Tiglii*).
240. Euphorbia resinifera, *Berg.*
Euphorbium.
241. Stillingia sylvatica, *Linn.*
Stillingia.

PIPERACEÆ.
242. Piper angustifolium, *R. & P.*
Maticæ Folia (*Matico*).

PIPERACEÆ (*continued*)
243. Piper Cubeba, *Linn. f.*
Cubeba.
Oleum Cubebæ.
244. P. longum, *Linn.*
Piper Longum.
245. P. nigrum, *Linn.*
Piper Nigrum (*Piper*).
White Pepper.
ARISTOLOCHIACEÆ.
246. Aristolochia Serpentaria, *Linn.*
Serpentariæ Radix (*Serpentaria*).
JUGLANDEÆ.
247. Juglans cinerea, *Linn.*
Juglans.
Other Medicinal Species of Juglans.
CUPULIFERÆ.
*248. Quercus Robur, *Linn.*
Quercus Cortex.
249. Q. infectoria, *Olivier.*
Galla.
250. Q. alba, *Linn.*
Quercus alba.
251. Q. tinctoria, *Bartram.*
Quercus tinctoria.
SANTALACEÆ.
252. Santalum album, *Linn.*
Lignum Santali.

Gymnospermæ.

CONIFERÆ.
*253. Taxus baccata, *Linn.*
Taxus.
254. Juniperus Sabina, *Linn.*
1. *Sabinæ Cacumina.*
2. *Oleum Sabinæ.*
Juniperus virginiana.
*255. J. communis, *Linn.*
1. *Juniperi Fructus* (*The Fruit*).
2. *Oleum Juniperi* (*Oil of Juniper*).
256. Pinus Pinaster, *Soland.*
1. *Oleum Terebinthinæ.*
2. *Resina.*
Galipot.
*257. P. sylvestris, *Linn.*
Pix Liquida.
Other Products.
CONIFERÆ (*continued*)
258. Pinus australis, *Mich.*
1. *Thus Americanum* (*Terebinthina*).
2. *Oleum Terebinthinæ.*
3. *Resina.*
259. P. Tæda, *Linn.*
1. *Thus Americanum* (*Terebinthina*).
2. *Oleum Terebinthinæ.*
3. *Resina.*
260. P. Larix, *Linn.*
Laricis Cortex.
Other Products.
261. P. Picea, *Du Roi.*
Pix Burgundica.
262. P. Abies, *Du Roi.*
Terebinthina Argentoratensis.
263. P. balsamea, *Linn.*
Terebinthina Canadensis.
264. P. canadensis, *Linn.*
Pix Canadensis.
Other Products.

MONOCOTYLEDONES.

Petaloideæ.

CANNACEÆ.
265. Maranta arundinacea, *Linn.*
Maranta.
266. Canna edulis, *Ker.*
Canna.
ZINGIBERACEÆ.
267. Elettaria Cardamomum, *Maton.*
Cardamomum.
268. Amomum Melegueta, *Rosc.*
Grana Paradisi.
269. Curcuma longa, *Linn.*
Turmeric (*Curcuma*).
270. Zingiber officinale, *Rosc.*
Zingiber (*Zingiberis Radix*).
271. Alpinia officinarum, *Hance.*
Galangæ Rhizoma.
ORCHIDEÆ.
272. Vanilla planifolia, *Andr.*
Vanilla.
IRIDEÆ.
273. Iris florentina, *Linn.*
Iris florentina.
Iris versicolor.

IRIDEÆ (*continued*)
274. Crocus sativus, *Linn.*
Crocus.

AMARYLLIDEÆ.
275. Crinum asiaticum, *Linn.*
Crini Radix.

PALMÆ.
276. Areca Catechu, *Linn.*
Areca.
277. Arenga saccharifera, *Lab.*
278. Metroxylon Sagu, *Rottb.*
Sago.

ARACEÆ.
*279. Acorus Calamus, *Linn.*
Calamus.

LILIACEÆ.
280. Allium sativum, *Linn.*
Allium.
281. Urginea Scilla, *Steinh.*
Scilla.
282. Aloe vulgaris, *Lam.*
Aloe Barbadensis.
Other Varieties of Aloes.
283. A. succotrina, *Lam.*
Aloe Socotrina.
284. A. spicata, *Linn.*
Aloe Capensis.
Natal Aloes.
Other Varieties of Aloes.

MELANTHACEÆ.
285. Veratrum album, *Linn.*
Veratrum album.
286. V. viride, *Soland.*
Veratri Viridis Radix (*Veratrum viride*).
287. Schœnocaulon officinale, *A. Gray.*
Sabadilla.
*288. Colchicum autumnale, *Linn.*
1. *Colchici Cormus* (*Colchici Radix*).
2. *Colchici Semina.*

SMILACEÆ.
289. Smilax officinalis, *Kunth.*
Sarzæ Radix (*Sarsaparilla*).
290. S. medica, *Schlecht. & Cham.*
Sarsaparilla.

Glumiferæ.

GRAMINEÆ.
291. Oryza sativa, *Linn.*
1. *Oryza.*
2. *Oryzæ Farina.*
292. Avena sativa, *Linn.*
Avenæ Farina.
293. Hordeum vulgare, *Linn.*
Hordeum Decorticatum (*Hordeum*).
294. Triticum sativum, *Lam.*
1. *Farina Tritici.*
2. *Amylum.*
3. *Mica Panis.*
*295. Lolium temulentum, *Linn.*
Lolii Semina.
296. Zea Mays, *Linn.*
Frumentum Indicum.
297. Andropogon Nardus, *Linn.*
Oleum Andropogi Nardi.
298. Saccharum officinarum, *Linn.*
1. *Saccharum Purificatum* (*Saccharum*).
2. *Theriaca. Syrupus Fuscus.*

CRYPTOGAMIA.

LYCOPODIACEÆ.
*299. Lycopodium clavatum, *Linn.*
Lycopodium.

FILICES.
*300. Aspidium Filix-mas, *Swartz.*
Filix mas.

LICHENES.
*301. Roccella tinctoria, *DC.*
Litmus.
Orchil and Cudbear.
*302. Cetraria islandica, *Ach.*
Cetraria.

FUNGI.
*303. Claviceps purpurea, *Tul.*
Ergota.

ALGÆ.
*304. Fucus vesiculosus, *Linn.*
Fucus vesiculosus.
*305. Chondrus crispus, *Lyngb.*
Chondrus.
306. Gracilaria lichenoides, *Grev.*
Gracilaria.

CORRECTIONS AND ADDITIONS.

No.

Vol. I.

4. 3rd p., l. 11 from bottom, for "freezes," read "fuses."
10. 1st p., l. 6, for "*Sp. Plant., ed.* 2, *p.* 664 (1764)," read "*Syst. Nat., ed.* 10, *p.* 1050 (1759)."
18. 4th p., add to references, J. Scott, Annual Report of Opium Cultivation (India) for 1874, with atlas of plates; Id., Manual of Opium Cultivation, 1877.
38. 1st p., add to Figures, Baill., l. c., figs. 124—129.
    3rd p., l. 4 from top, for "122°," read "about 95°."
    3rd p. l. 6 from top, after 18°, add C.
59. 1st p., line 11, for "Arabia," read "Abyssinia."
    1st p., add to Figures, Vahl, Symbolæ Botan., t. 11 (drawn from Forskål's specimen).
    2nd p., l. 2 from bottom, for "are said to have been," read "were."

Vol. II.

71. 2nd p., l. 9 from bottom, for "They were," read "It was."
80. 2nd p., add to references, Holmes in Pharm. Journ., 10 May, 1879, p. 913; Trimen in Journ. Bot., 1879, p. 185.
89. 1st p., l. 2 from bottom, after "two," insert "lateral of the three."
91. 1st p., l. 8 from bottom, after "specimen," insert "of Forskål's."
    2nd p., Eastern Trop. Africa as far south as Mozambique, may be added to the range of *C. angustifolia*.
93. 1st p., 2nd footnote, Prof. Flückiger has shown that the consul's name, however, was Langsdorff (see Pharm. Journ., 22 March, 1879, p. 773).
94. 3rd p., l. 18, A. gummifera; for an account of this in Morocco, see Hooker and Ball's Travels in that country, Appendix.
102. The lettering of this plate should be altered to correspond with the text.
112. 6th p., l. 5 from top, for with "acids," read with "alkalies."
113. Plate. The leaves should be "opposite," not "alternate."
121. 1st p., l. 8 from bottom, for "tube," read "teeth."
123. 1st p., l. 6, delete the *.
126. 4th p., add to references, Regel & Schmalhausen in Garten-Flora, 1878, p. 195; C. B. Clarke in Fl. Brit. India, ii, p. 708.
127. Alter lettering of plate to correspond with the text.

129, 130, 131 } Text and plates to be altered to { 130, 131, 129 } and rearranged accordingly.

130 (129). 3rd p., l. 7 from bottom, for "lung," read "drug."
139. 1st p., l. 7, for "*Fl. Ind.*, i, p. 517 (1832)," read "*Hort. Bengal. Appendix* (1814)."
141. 1st p., add to Figures, Bot. Mag., t. 6434 (June, 1879).

No. VOL. III.

151. 1st p., l. 10, after "Germ." insert "xvi."
161. 2nd p., l. 16, for "&c.," read "DC."
161. 5th p., l. 12 from top, for "aphrodisiac," read "anaphrodisiac."
162. 1st p., l. 8, for "*in Act. Upsal.*, 1741, p. 23," read "*Sp. Plant., ed.* 1, *p.* 931 (1753)."
167. 1st p., heading, for "16," read "167."
178. 2nd p., l. 14, take out comma after "*hilum.*"
183. The genus *Ophelia* is reduced to *Swertia* in B. & H. Genera, vol. ii, p. 816.
186. 1st p., l. 6, for "*Ipomæa*," read "*Ipomœa. Exogonium* is reduced again to *Ipomœa* in B. & H. Gen., ii, p. 870."
190. First footnote. The plant of Theophrastus has been considered to be *S. Melongena.*
191. 4th p. We are now informed by M. Vidal, of Manila, that *N. repanda* is not to be found in Cuba, either wild or cultivated, all the tobacco there grown being *N. Tabacum.* The Manila plant is quite the same, having, indeed, been brought there from Cuba.
194. 2nd p., add to references, Holmes, in Pharm. Journ., 1877, p. 1018.
212. 2nd p., l. 13 from bottom, insert before "only" the words, "are often."
213. 3rd p., l. 16, for "south," read "north."
214. 2nd p., l. 14, for "murem," read "murum."
215. 4th p., l. 4 from bottom. The plant is also grown by Mr. Tustan at Milcomb, about six miles from Banbury.
222. 3rd p., l. 12, after "U. S. P.," add "OLEUM CAMPHORÆ; the volatile oil obtained from Camphora officinarum (U. S. P.)."
224. 1st p., l, 4, for "*Breyn. in Ephem.*," &c., read "*Blume, Bijdragen Fl. Ned.-Ind.*, p. 568 (1825)."
1st p., l. 3 from bottom, for "obcordate," read "cordate."

VOL. IV.

229. 1st p., l. 2, for "*Morea*," read "*Moreæ.*"
236. 3rd p., l. 12 from bottom, for "water," read "ether."
240. 2nd p. Messrs. Hooker and Ball saw the plant only at Mesfiouia from a garden there (see their "Travels," p. 163, and Appendix).
249. 3rd p. The * should be after the first, not the second paragraph.
263. 5th p., l. 6 from bottom, for "6," read "5."
267. 1st p., l. 15, for "flower," read "barren."
273. 1st p., l. 6, for "*Sp. Pl., ed.* 2, p. 55 (1762)," read "*Syst. Nat., ed.* 10, p. 863 (1759)."
277. 3rd p., l. 19, for "*læve*," read "*Sagu.*"
279. 3rd p., l. 3 from bottom, for "Anoid," read "Aroid."
282. 3rd p., l. 6, for "Ind.," read "Med."
,, 5th p., last line, for "*ferox*," read "*spicata.*"
295. 6th p. *Stipa sibirica* is poisonous to cattle in Kashmir according to Dr Aitchison (see Kew Gardens' Report for 1877).
299. 2nd p., l. 9, for "healthy," read "heathy."
300. 3rd p., l, 13, for "painted," read "printed."
304. 6th p., l. 12 from bottom, insert a comma after Paul.

D.Blair F.L.S. ad nat. del. et lith.

M. & N. Hanhart imp.

HYDRASTIS CANADENSIS Linn.

Natural Order RANUNCULACEÆ. Lindley, Vegetable Kingdom, p. 425; Le Maout & Decaisne, System of Botany (English ed.), p. 171; Baillon, Histoire des Plantes, vol. i.

Tribe *Helleboreæ.*

Genus Hydrastis,* *Ellis.* Bentham & Hooker, Genera Plantarum, i, p. 7; Baillon, l. c., p. 82. The following is the only species.

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1. Hydrastis canadensis, *Linn., Syst. Naturæ, ed.* 10, *p.* 1088 (1759).

Yellow-root. Yellow Puccoon. Yellow-seal.

Synonym.—Warnera canadensis, *Miller, Dict.*

Figures.—Barton, ii, t. 26; P. Miller, Figures, ii, t. 285; Bot. Mag., t. 3019; A. Gray, Ill. Gen. N. Amer. Pl., t. 18.

Description.—A small perennial herb with a horizontal, irregularly knotted, bright yellow rootstock giving off slender roots below and marked with scars of the flower-stems of previous years. Flowering stem about 6—12 inches high, erect, cylindrical, hairy with downward-pointing hairs especially above, surrounded at the base with a few short brown scales. Cauline leaves two, placed high up, the lower one stalked the upper sessile, roundish in outline but palmately cut into 5—7 deep lobes, irregularly serrate, strongly veined, hairy, dark green; radical leaf solitary, on a long petiole, similar in form. Flowers solitary, terminal, erect, small. Sepals 3, equal, imbricate, petaloid, oval, concave, greenish-white, falling away immediately after expansion. Petals none. Stamens numerous, hypogynous, about as long as the sepals, spreading, filaments flattened, anthers small, adnate. Carpels 12 or more, distinct, sessile, ovary hairy, with 2 ovules attached to the middle, style short, stigma flat, 2-lipped. Fruit a head of small fleshy, oblong, crimson berries, tipped with the persistent styles. Seeds 2 (or 1) in each berry, hard black, shining,

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* *Hydrastis,* probably from ὕδωρ, water, and δράω, to accomplish; from its alleged effects on the mucous membranes (?).

broadly obovate, with a long linear hilum, testa crustaceous, embryo minute in the base of the abundant fleshy endosperm.

Habitat.—A somewhat rare native of rich shady woods in North America, extending from Canada to the northern United States, and along the mountains of Georgia and Carolina, chiefly in the Alleghany chain. The flower-stem is pushed up early in the spring, and the fruit, which looks like a raspberry, is ripe in July. The leaves have by this time attained their full growth, measuring from 6—9 inches in width, and contribute to carry out the resemblance to one of the herbaceous species of *Rubus*.

It was first introduced by P. Miller in 1759, and figured by him in 1760, under the name *Warneria* (afterwards changed to *Warnera*) given in honour of Richard Warner, of Woodford. The plant has been grown recently at Kew, Edinburgh, and Dublin.

Hook., Fl. Bor.-Am., i, p. 9; Gray, Man. Bot. N. United States, p. 47; Chapman, Fl. South. States, p. 11; DC., Syst. Veg., i, p. 218; Lindley, Fl. Medica, p. 3.

Official Part and Name.—HYDRASTIS; the root (U. S. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of India. Besides its official name of *Hydrastis*, it is commonly known as *Yellow root*, *Orange root*, *Yellow Puccoon*, and *Golden Seal*.

General Characters and Composition.—The part used in medicine and for other purposes is commonly termed the root, but correctly speaking it is the rhizome with its adherent rootlets. In commercial specimens the rootlets are found partly attached to the rhizomes, and partly detached from and mixed with them. The *rhizome* is generally simple, although very rarely it is branched. In length it averages about an inch, but it varies in this respect from half an inch to an inch and a half, or even in some cases more. It varies from one twelfth to half an inch in thickness, averaging about one fourth of an inch. It is much twisted and knotted, and has thus a very irregular form and appearance. The upper surface presents several irregularly rounded projections, terminated by scars produced by the decay of the aerial stems; and in some instances a portion of the aerial stem may be found

attached to the rhizome. The external surface is marked by slight longitudinal furrows and corresponding projections, and by evident annular scars. From the lower surface of the rhizome principally, but also in part from the sides and upper surface, numerous small, more or less twisted, rootlets arise, or when these are absent their position is marked by yellowish projecting scars. It has at first a yellowish-brown colour, but it becomes darker brown by keeping. When fresh the rhizome has a well-marked narcotic odour, which is lost in a great measure by age, when it acquires a peculiar sweetish smell, somewhat resembling liquorice root. It has a very bitter, feebly opiate taste, more especially when freshly dried. Its fracture is close and resinous. A transverse section of the recently dried rhizome presents a central bright yellow portion, surrounded by a darker coloured zone, which is principally formed of radiating woody bundles; and on the outside of this a yellow cortical portion may be noticed.

The *rootlets* vary in length, being in some cases as much as two, three, or even more inches; their average size is about that of a common needle. Externally they present a yellowish-brown colour, are more or less twisted, and either smooth or marked by irregular, faint, longitudinal striæ. Their fracture is close. In taste and odour they resemble the rhizomes. Internally they have a bright yellow colour, which darkens by age to some shade of brown. A transverse section shows a small central meditullium, surrounded by a yellow cortical portion.

Hydrastis has been analysed by Durand, Tilden, Mahla, Perrins, Van der Espt, and other chemists, and its principal constituents have been proved to be two alkaloids, namely *berberia* and *hydrastia*. Recently also, A. K. Hale discovered what he believed to be a third alkaloid; and his results have been confirmed by John C. Burt. The experiments of Perrins prove that berberia exists in the proportion of nearly 4 per cent. in hydrastis; and of the alkaloid hydrastia, the same observer obtained 1·5 per cent. Berberia, which was first discovered in the common Barberry, *Berberis vulgaris*, has now been found not

only in Hydrastis, but also in various other medicinal substances, more especially those combining a bitter taste with a yellow colour, as Calumba, Coptis, Xanthorhiza, Podophyllum, and others obtained from plants of the Berberidaceæ, Ranunculaceæ, Menispermaceæ, and Xanthoxylaceæ. *Hydrastia* crystallises in brilliant four-sided prisms, which when pure are colourless, inodorous, and almost tasteless; it is nearly insoluble in water, but readily soluble in alcohol, ether, and chloroform. It forms salts with acids; and the solutions of these as well as that of hydrastia itself have a bitter, somewhat acrid taste. The properties of hydrastis are due, so far as is known, to the alkaloids berberia and hydrastia. Nothing is known of the action of the recently discovered third alkaloid, which as yet has not even been named. The drug used by the eclectic practitioners in the United States under the name of *hydrastin,* is a crystalline substance, which is said to be a mixture of hydrochlorate of berberia and hydrastia.

Adulterations.—Hydrastis has been recently found very largely adulterated in Cincinnati, with beet-root, serpentary, cypripedium, sanguinaria, podophyllum, and other substances; but this admixture was doubtless accidental.

Medical Properties and Uses.—Hydrastis possesses well-marked tonic properties; but various other effects have also been ascribed to it by different practitioners. Thus it is said to be aperient, to exercise an especial influence over mucous surfaces, and to act as a cholagogue, deobstruent, diuretic, &c. It has been employed as a tonic in similar cases to that of calumba; as an antiperiodic, in place of quinia; as a laxative in constipation and piles; in jaundice and other diseases of the liver, as a cholagogue; and as an alterative in various diseases of the mucous membranes, as catarrh, cystirrhœa, leucorrhœa, gonorrhœa, &c. In the latter diseases it has been used locally as an injection, in the form of an infusion or decoction, as well as internally. But as a remedy in nearly all the above complaints it requires further investigation. Its value, however, as a medicine in some diseases would appear to be now fully recognised in the United States,

as in the last Revision of the Pharmacopœia of that country it was transferred from the Secondary to the Primary List of the Materia Medica.

Besides the use of hydrastis as a medicinal agent, it has been employed by the Indians of the Western States of North America as a dye. Durand states, that "it imparts to linen a rich and durable light yellow colour, of great brilliancy, which might probably by proper mordants give all the shades of that colour, from the pale yellow to the orange. The lake produced by the bichloride of tin might also prove a useful pigment in oil and water-colour painting."

U. S. Disp., by W. & B., p. 469; Bentley, in Pharm. Journ., ser. 2, vol. iii, p. 540; Amer. Journ. Pharm., 1876, p. 226; Durand, in Amer. Journ. Pharm., vol. xxiii, p. 112; Mahla, in Silliman's Amer. Journ. Science and Art, Jan., 1862, and Amer. Journ. Pharm., vol. xxxiv, p. 104; Perrins, in Pharm. Journ., ser. 2, vol. iii, p. 546; Grover Coe's Concentrated Organic Medicines, p. 359; Pharm. Journ., ser. 3, vol. iii, p. 604, from L'Union Pharmaceutique, vol. xiii, p. 321; Hale, in Amer. Journ. Pharm., vol. xlv, June, 1873, p. 247; Burt, in Pharm. Journ., ser. 3, vol. vi, p. 467, and Journ. Chem. Soc., vol. xiii, p. 296, and Proc. Amer. Pharm. Ass., vol. xxiv, p. 156.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected in N. America by Clayton

1. A plant in flower; the sepals fallen.
2. A sepal.
3. A stamen.
4. A carpel.
5. The same opened.
6. Head of fruit.
7, 8. Seeds.
9. Section of the same.
10. A leaf full-grown.
11. Diagram of the sepals.

(2–5, 7–9, 11 enlarged.)

E Blair ad viv del[t] et lith

M & N Hanhart imp

HELLEBORUS NIGER,

N. Ord. Ranunculaceæ.

Tribe *Helleboreæ.*

Genus Helleborus, *Linn.** B. & H., Gen. i, p. 7; Baill., Hist. Pl., i, p. 79. There are about 12 or 14 species, natives of Europe and Western Asia.

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2. Helleborus niger, *Linn., Sp. Plant., ed.* i, *p.* 558 (1753).

Black Hellebore. Christmas Rose.

Figures.—Woodville, t. 169; Hayne, i, tt. 7, 8; Stephenson & Churchill, t. 11; Nees, t. 393, and Suppl., t. 48; Berg & Schmidt, t. 2 e and f; Bot. Mag., t. 8; Jacq., Fl. Austr., iii, t. 301; Reichenbach, Ic. Fl. Germ., iv, tt. 111, 112.

Description.—A perennial herb with a cylindrical, brownish-black, knotted, brittle, fleshy, subterranean, bracteated, definite rhizome, with its numerous branches much interlaced, and giving off many stout, fibrous, straight, brown roots. Leaves from the extremities of the rhizome-branches on long, cylindrical, tapering, pale green, mottled with red petioles, pedate, the lateral divisions deeply divided into 2—4 nearly separate lobes successively smaller towards the petiole, coriaceous, nearly evergreen, smooth, shining, dark-green above, paler and reticulated beneath, lobes obovate-cuneate, acute or blunt, margin entire below, coarsely serrate above. Flower-stalks terminating the rhizome, surrounded at the base with a loose entire bract, shorter than the leaves, cylindrical, smooth, tapering, mottled with pink below, 1- (rarely 2-) flowered, with 2 or 3 large, ovate, acute, concave bracts a little below the flower. Sepals 5, equal, large, fleshy, roundish-oval, persistent, white with a pink tinge, afterwards becoming greenish, spreading horizontally. Petals 8—13 or more, small, shorter than the stamens, green, tubular, with an oblique bilabiate orifice, the claw filiform. Stamens numerous, hypogynous, inserted on

* Helleborus, ἑλλέβορος, the classical name. The celebrated plant of antiquity is supposed to have been *H. orientalis*, Lam.

the hollow receptacle in many rows; filaments slender, white. Carpels 5—8, free, elevated on the centre of the receptacle; ovaries ovoid-oblong, smooth; styles long, projecting beyond the stamens; stigmas terminal. Fruit follicular, sessile; pericarp leathery, dehiscing along the ventral suture. Seeds several, in two rows, oval, black, shining; embryo small, at the base of plentiful horny endosperm.

Habitat.—A native of Central and Southern Europe, not reaching Britain or North Germany, but extending eastward to South Poland, and westward to Dauphiny and Provence. From its flowering in midwinter—December to March—it is a favourite in our gardens, where it has been cultivated for centuries, and is found under several varieties, and where its large and handsome flowers are very welcome at a time when there is scarcely anything else in bloom in the open air. The fruit ripens in April and May, and the leaves remain for some months afterwards.

DC. Syst. Veg., i, p. 316; Gren. & Godr., Flore de France; Koch, Synopsis Fl. Germ., ed. 2, p. 21; Lindley, Fl. Medica, p. 6.

Official Part and Name.—Helleborus; the root (U. S. P.). Not official in the British Pharmacopœia, or the Pharmacopœia of India.

General Characters and Composition. — Black Hellebore is usually imported from Germany. As met with in commerce, it is commonly known as *black hellebore root;* but in reality it consists of two parts,—the rhizome, and the rootlets or roots which spring from it. In commercial black hellebore, the roots are more or less detached from the rhizome, and mixed with it. The rhizome presents a very irregular, knotted, twisted appearance, and occurs in pieces which vary in length from 1 to 2 or 3 inches, and in thickness from about $\frac{1}{4}$ to $\frac{1}{2}$ an inch; it is marked externally with transverse ridges and slight longitudinal furrows. A transverse section exhibits a thick bark, surrounding an internal woody portion (*meditullium*) of a whitish colour, and divided to some

extent into wedge-shaped portions. The roots are numerous, unbranched, cylindrical, about the thickness of a common knitting needle, and usually several inches in length, and when broken across they present a central undivided, or but very slightly stellate, woody axis or meditullium, of a whitish or yellowish-white colour. Both the rhizome and roots have a brownish-black colour; a feeble odour, which has been compared to that of senega root; and a bitterish, slightly acrid taste.

The rhizome and roots of Baneberry (*Actæa spicata*) are frequently substituted for, or mixed with, black hellebore, but the former may be readily distinguished by making a transverse section, or breaking across one of its roots, which will be found to exhibit a meditullium with the woody bundles distinctly arranged in a cruciate, triangular, or more or less radiate manner, according to its thickness, whereas in black hellebore the roots have an entire or but very slightly divided meditullium. Another ready means of distinguishing the spurious drug is by adding to its infusion a solution of a persalt of iron, when it is immediately blackened, owing to the presence of tannic acid. No change is produced in an infusion of black hellebore under the same circumstances, as it contains no tannic acid.

Bastick first discovered a crystalline, non-volatile, neutral principle in black hellebore, having a bitter taste, and also producing a tingling sensation on the tongue. Subsequently, Marmé and Husemann obtained from the leaves and roots of black hellebore, and from similar parts of *Helleborus viridis*, two glucosides, which they called *helleborin* and *helleborein*. Both were obtained in crystals; the former being resolvable into sugar, and a peculiar principle which they termed *helleboresin;* and the latter into sugar, and a principle with a fine violet colour called *helleboretin*. Both helleborin and helleborein are stated to be poisonous, and the former highly narcotic.

Medical Properties and Uses.—Black hellebore is a drastic hydragogue cathartic, and is also regarded as an emmenagogue and anthelmintic. It was greatly esteemed by the ancients, but at present is but little employed in this country. In the United

States it is chiefly valued as an emmenagogue. It has been employed in mania, melancholia, epilepsy, dropsy, amenorrhœa, dysmenorrhœa, chronic skin affections, worms, and other diseases. In large doses it is a powerful acro-narcotic poison.

Black hellebore is sometimes used, both internally and externally, as a medicine for domestic animals.

Per. Mat. Med., vol. ii, pt. ii, p. 681; Pharmacographia, p. 2; Per. Mat. Med., by B. & R., p. 994; U. S. Disp., by W. & B., p. 449; Bastick, in Pharm. Journ., vol. xii, 1 ser., p. 274; Bentley, in Pharm. Journ., vol. ii, ser. 2, p. 464, and vol. iii, p. 112; Carson, in Amer. Journ. Pharm., vol. xx, p. 163.

DESCRIPTION OF PLATE.

Drawn from a specimen grown in Messrs. Veitch's Nursery, Chelsea; flowering in January.

1. Vertical section of flower.
2. A petal.
9. Vertical section of the same.

(3 and 4 enlarged.)

D Blair F.L.S. ad nicc. del et lith.

M & N Hanhart imp.

COPTIS TRIFOLIA, *Salisb.*

N. Ord. RANUNCULACEÆ.

Tribe *Helleboreæ*.

Genus Coptis,* *Salisb.* B. & H., Gen., i, p. 8; Baill., Hist. Pl., i, p. 17. Species about 8, natives of the colder parts of the northern hemisphere.

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3. Coptis trifolia, *Salisb., in Trans. Linn. Soc.,* viii, *p.* 305 (1807).

Gold-thread.

Syn.—Helleborus trifolius, *Linn.* Anemone grœnlandica, *Oeder.*

Figures.—Bigelow, i, t. 5; Barton, ii, t. 34; Flora Danica, tt. 566 and 1519; Pallas, Fl. Rossica, iii, t. 1; A. Gray, Ill. Gen. N. Amer. Pl., t. 13.

Description.—A small perennial herb, with a very slender, long, filiform, bright yellow, creeping, branched rhizome, sending up small tufts of leaves and flowers surrounded at the base with several acuminate yellow scales. Leaves tufted, on slender petioles 2—4 inches long, evergreen, erect, ternate, leaflets sessile, nearly equal, ¾—1 inch long, obovate, wedge-shaped at the base, rounded and more or less 3-lobed at the apex, sharply spinous-dentate, smooth, shining, thick, dark green. Flower solitary, erect, terminating a very slender, erect, smooth, axillary peduncle, as long as or longer than the leaves and with a single small bract above the middle. Sepals 5 or 6, imbricate, equal, spreading, petaloid, star-like, narrowly ovate, white, deciduous. Petals 5—6, very small, club-shaped, hollowed at the end, yellowish. Stamens numerous, hypogynous, filaments long, filiform, shorter than the sepals, anthers rounded. Carpels 3—7, stalked, spreading, smooth, with numerous ovules in two rows and a recurved style. Fruit of 3—7 small, stalked, spreading membranaceous follicles, compressed laterally and terminated by a curved beak. Seeds 4—8, small, horizontal, narrowly ovoid, shining, black, embryo minute at the base of the endosperm.

Habitat.—This pretty little creeping plant is found abundantly

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* *Coptis,* from κόπτω, to cut; from the form of the leaflets.

in peat-bogs and swamps, and in mossy sandy damp ground, flowering in April and May, over an extensive area in the colder parts of the northern hemisphere. It is abundant in Canada from Unalashka to Labrador and Newfoundland, and extends southwards in the United States along the highest hills to Maryland; it occurs also in Southern Greenland. In the Old World it is found in Japan, most parts of Siberia, Amur-land and Kamptschatka, and extends also into Europe, being found in the north-east of Russia in Wiatka and Kasan.

It has been cultivated in several botanic gardens here, having been first grown in 1782.

Hook., Fl. Bor.-Americ., i, p. 23; Gray, Man. Bot. U. States, p. 45; Franchet & Savatier, Enum. Plant. Japon., p. 10; Ledebour, Fl. Rossica, i, p. 52; DC., Syst. Veget., i, p. 322; Lindl., Fl. Medica, p. 8.

Official Part and Name.—Coptis; the root (U. S. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of India; but in the latter volume, an allied species, Coptis Teeta, *Wallich*, is official. This is described below after Coptis trifolia.

General Characters and Composition.—*Coptis*, or *Goldthread*, as found in a dried state in commerce, is usually in loosely aggregated masses, which consist of long, very brittle, filamentous, interlacing roots, mixed in varying proportions with the stems and leaves of the same plant. The roots have a deep golden-yellow colour. They are without odour; but have a pure bitter taste, without any aroma or astringency. This drug imparts its bitterness to both water and alcohol, but most perfectly to the latter. All parts of the plant have the same pure bitter taste, but this is most evident in the root.

The existence of Berberia in this root has been long demonstrated by the experiments of Professors Procter, Maisch, and Meyer. It has been recently analysed by Edward Z. Cross, who finds the following constituents:—*resin, albumen, fixed oil, colouring matter, lignin, extractive, sugar, berberia,* and another alkaloid which seems to resemble hydrastia very closely, which he has

named *coptina*. It contains neither tannic nor gallic acid; hence it is a pure bitter; its bitterness being essentially due to *berberia*.

Medical Properties and Uses.—Goldthread is a tonic resembling quassia, gentian, and other pure bitters. Wood says it is applicable in all cases where quassia is employed, and might therefore be substituted for it, though from its high price it is not likely to come into general use. In New England it is popularly used as a wash in the treatment of aphthous sore mouths of children, but there is no evidence of its possessing any virtues in this complaint beyond such as are common to the simple bitters generally.

Per. Mat. Med., vol. ii, pt. 2, p. 698; U. S. Disp., by W. & B., p. 336; Stillé's Therap. and Mat. Med., vol. i, p. 476; Amer. Journ. Pharm.. March, 1863, p. 97; Gross, in Amer. Journ. Pharm., May, 1873, p. 193, and Year Book of Pharmacy, 1873, p. 20.

Other Official Species of Coptis.—In the Pharmacopœia of India, the dried root (*Coptidis Radix*) of Coptis Teeta, *Wall.*, is official. It is commonly known under the names of *Mishmi Bitter* and *Mishmi Tita;* and in Scinde, as *Mahmira*. By the Chinese it is called *Hwang-lien* or *Honglane*, and *Chuen-lien* or *Chonlin*. It is also said to be identical with the Chinese drug *Mu-lien*.

General Characters and Composition.—Coptis or Tita root is imported into Bengal from the Mishmi Country, in Assam, in neat little baskets or bags, with open meshes, made of narrow slips of rattan, each containing from half an ounce to two ounces of the drug. It is found in this state in the bazaars of India. It has been imported in bulk, and offered for sale in the London market. Coptis root is thus described in the official notice of this drug in the Pharmacopœia of India:—"It consists of pieces of a woody rhizome, of the thickness of a small goose-quill, and from one to two inches in length, often contracted at one extremity into a short woody stem; the surface is usually rough, irregular, more or less annulated, and marked

with the remains of rootlets in the shape of short spiny points. Externally it is of a yellowish-brown colour, internally much brighter, frequently of a golden-yellow colour, exhibiting on fracture a radiated structure. Taste persistently bitter, and when chewed tinges the saliva yellow." It has no odour.

The properties of this drug are due to *berberia*, of which the rhizome contains, according to Perrins, 8½ per cent., a larger proportion than has hitherto been found in any other of the many drugs containing that alkaloid. As the yellowing colouring matter (bitter principle) of coptis is readily soluble in water, berberia must exist in it combined with an acid to form a soluble salt, as in itself berberia is almost insoluble in that fluid. The nature of this acid is still to be ascertained; as also whether, as we just described in treating of *Coptis trifolia*, berberia is not associated with a second alkaloid.

Medical Properties and Uses.—Tita is a pure bitter tonic possessing neither aroma nor astringency; hence it may be employed in all cases requiring such remedies, as in debility, atonic dyspepsia, recovery from exhausting diseases, mild forms of intermittent fevers, &c. It is much used in India and China. Dr. Stock also states that in Scinde, the root, under the name of *Mahmira*, is used in inflammation of the eyes.

Per. Mat. Med., vol. ii, pt. 2, p. 698; Pharmacographia, p. 3; Pharmacopœia of India, pp. 4 and 435; O'Shaughnessy's Bengal Disp., p. 163; Wallich, Trans. of Med. and Phys. Soc. of Calcutta (1836), vol. viii, p. 85; Pereira, in Pharm. Journ., ser. 1, vol. xi, p. 294; Guibourt, Hist. des Drog., vol. ii (1849), p. 526; Perrins, in Journ. of Chem. Soc., vol. xv, p. 339; Pharm. Journ., ser. 3, vol. vi, p. 101.

DESCRIPTION OF PLATE.

Drawn from plants in the British Museum collected by Nuttall in N. America. 1. A plant in flower. 2. Section of a flower. 3. A sepal. 4. A petal. 5. A stamen. 6. A carpel. 7. A plant in fruit. 8. A follicle opened. 9. Seed. 10. Section of the same. (2–6, 8–10 enlarged.)

DBlair ad nat. del. et lith.

M&N Hanhart imp

DELPHINIUM STAPHISAGRIA, *Linn.*

N. Ord. RANUNCULACEÆ.

Tribe *Helleboreæ.*

Genus **Delphinium,*** *Linn.* B. & H., Gen., i, p. 9; Baill., Hist. Pl., i, p. 80. Species about 50, natives of the north temperate regions of both old and new worlds.

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4. Delphinium Staphisagria,† *Linn., Sp. Plant., ed.* 1, *p.* 531 (1753).

Stavesacre.

Syn.—Staphisagria macrocarpa, *Spach.*

Figures.—Woodville, t. 154 (*D. pictum*, DC.); Flora Græca, t. 508, cop. in Steph. & Ch., t. 55; Nees, t. 394; Reichenb., Ic. Fl. Germ., iv, t. 69; Baill., Hist., i, figs. 53–58.

Description.—An annual (or biennial ?) herb, with a large tapering root, and a stout, erect, cylindrical, slightly branched stem reaching 3 or 4 feet in height, very finely downy and densely covered with long soft spreading hairs. Leaves alternate, on long hairy stalks, palmately veined, the lower ones roundish, 4 or 5 inches in diameter, cut into 7—9, equal, broad, overlapping lobes which are trifid with acute segments, the upper ones more deeply divided into 5—7, oval or lanceolate, blunt or acute, entire or slightly lobed segments, pubescent or nearly smooth above, hairy on the veins beneath, bright green. Flowers large, on long stout very hairy stalks in the axils of leafy bracts, and with 2 smaller opposite bracts at the base of each pedicel, arranged in long lax racemes or panicles at the ends of the stem and branches. Sepals 5, petaloid, irregular, spreading, very hairy outside, glabrous within, purplish-blue, veined, the posterior one ovate provided at the base with a short, blunt, faintly 2-lobed, hollow spur projecting backward, the two

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* *Delphinium*, from the resemblance of the unopened flowers to the head of a dolphin (*delphin*) as formerly represented by artists.

† *Staphisagria*, σταφὶς ἀγρία, the ancient Greek name, *herba pedicularis* of the Romans; from its use. The English Stavesacre is of course a corruption.

anterior broadly oval, blunt. Petals usually 4, the two posterior narrowly oblong, erect, connected below, each prolonged at the base behind into a thick hard tapering spur projecting backward into the pouch of the posterior sepal, the two lateral wing-like, with a long claw and a dilated unilateral rounded limb somewhat crisped on the margin. Stamens numerous, hypogynous, filaments curved, dilated below, anthers yellow. Carpels 3, erect, tapering, covered with silky hairs, with few ovules in a double row, styles rather long, smooth, shortly bifid. Fruit of 3 thick, oblong, erect, hairy, veined follicles prolonged above on the outer side into a curved beak (the style) dehiscing by their ventral (inner) suture. Seeds about 12 in each follicle, densely packed and more or less flattened, about $\frac{1}{4}$ in. in their longest diameter, irregularly quadrilateral with sharp angles, testa thick, deeply netted and pitted, dark brown, embryo minute, embedded at the edge of the copious oily endosperm.

Habitat.—This species is found in the countries of the Mediterranean region, from Portugal and Spain to Greece and Crete, and also extends into Asia Minor and the Canary Islands, growing in dry bushy places and flowering in early summer. It is grown in most of our botanic gardens, and is cultivated for use in the South of France and Italy. Like some other species of the genus the flowers vary in colour, being sometimes pink, or pale blue; the whole plant has a somewhat unpleasant odour when handled. The seeds vary considerably in size.

Woodville's plate above quoted is referred by De Candolle to *D. pictum*, Willd., a plant chiefly known in gardens, but also found in Sardinia. Its differences being of a comparative nature seem scarcely sufficient to warrant its specific separation.

Bertolini, Fl. Ital., v, p. 413; Boiss., Fl. Orient., i, p. 94; Gren. and Godr., Fl. France, i, p. 49; DC., Syst. Veg., i, p. 363; Lindl., Fl. Med., p. 9.

Part Used and Name. — Staphisagriæ Semina; the seeds. Stavesacre seeds are not official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United

States ; but they were formerly official in the London and Edinburgh Pharmacopœias.

General Characters and Composition.—Stavesacre seeds are imported from Nismes and other parts of the South of France, and also from Trieste. In form they are irregularly triangular or obscurely quadrangular, distinctly arched on one side, and in weight each averages a little over half a grain. The testa is of a blackish-brown colour when the seeds are freshly dried, but it becomes dull greyish-brown when they have been long kept ; its surface is wrinkled and deeply pitted. When the somewhat brittle testa is removed the nucleus is found to be soft, whitish, and of an oily nature. Stavesacre seeds have no very marked odour, but a bitter nauseous taste, which is followed after they are chewed by a burning and tingling sensation.

The seeds are said to contain no less than three alkaloids, *delphinia, staphisaïne,* and *staphisagrine ;* also a crystalline acid termed *delphinic acid ;* a *fatty oil* in the proportion of about 26 per cent. and belonging to the non-drying class of oils ; and other substances of no importance. But little is known of the properties of staphisaïne and staphisagrine ; but staphisaïne is readily distinguished from delphinia by its insolubility in ether. The activity of stavesacre seeds would appear to be essentially due to *delphinia.* This alkaloid, which is also termed *delphinine,* and *delphine,* as usually found in commerce, is in very minute rhombohedric crystals, but larger crystals may be obtained ; it freezes at 248°, and is soluble in ether, alcohol, and chloroform, but almost insoluble in water. Of *delphinic acid* nothing definite is known, but Hofschläger, its discoverer, described it as white, crystalline, volatile, and in small doses as a powerful emetic.

Medical Properties and Uses.—Stavesacre seeds possess emetic, purgative, and anthelmintic properties, and were formerly employed internally to produce such effects ; but on account of their violent action they are no longer used. It would appear also that they have narcotic properties ; indeed, they are used in some parts of the world to intoxicate fish in the same manner as Cocculus indicus. The powdered seeds have been used

externally from the earliest times for the destruction of *pediculi* on the head and other parts of the body, both in the human subject and in cattle; hence the German name *läusesamen*, signifying *louse-seeds*. They may also be employed for a like purpose in the form of an ointment or acetous infusion. An ointment made from the fatty oil of stavesacre seeds has been also highly recommended by Dr. Balmanno Squire in *prurigo senilis*, which is essentially due to the presence of pediculi. Stavesacre seeds have been also employed in eczema, psora, and other skin affections, both externally and internally; and a strong tincture has been used as a liniment in rheumatism and neuralgia.

Delphinia has been used both internally and externally, but it is a dangerous remedy for internal administration. Externally, however, in the form of ointment or tincture, it has been successfully used in neuralgic and rheumatic affections; but aconitia is generally regarded as far more useful in similar cases, and has almost entirely superseded the use of delphinia in regular practice.

Per. Mat. Med., by B. & R., p. 996; Pharmacographia, p. 5; U. S. Disp., by W. & B., p. 1699; Watts' Dict. Chem., vol. ii, p. 310; Turnbull on the Medical Properties of the Ranunculaceæ, pp. 114–118; Journ. de Pharm., vol. xix, p. 519; Ann. de Chim. et de Phys., vol. l, p. 2; Balmanno Squire, in Pharm. Journ., vol. vi, 2nd ser., p. 405.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Garden of the Apothecaries' Company, Chelsea.

1. Portion of the main stem with fruit, and a lateral branch with flowers.
2. Sepals separated.
3. Vertical section of flower.
4. The two posterior petals.
5. A lateral petal.
6. A stamen.
7. Summit of style.
8, 9. Seeds.
10. Section of a seed.

(4–7, 9, 10 enlarged.)

Delphinium Consolida, *Linn.*

Larkspur.

Official Part and Name.—DELPHINIUM, *Larkspur;* the seed of Delphinium Consolida (U. S. P. *Secondary*). In the last U. S. P. the root was official, but it is not mentioned in the present issue. No part of the plant is official in the British Pharmacopœia, or the Pharmacopœia of India. This plant, which was introduced from Europe, has now become naturalised in some parts of the United States. Its specific name is derived from the power its flowers were formerly supposed to possess of healing or consolidating wounds.

General Characters, Composition, Medical Properties, and Uses.—The seeds have a very acrid and somewhat bitter taste, and have been found by Mr. Hopkins, of Baltimore, to contain *delphinia* as their essential constituent; and also amongst other substances a *volatile oil, fixed oil,* and *resin. Aconitic acid* has likewise been obtained from the expressed juice of the plant.

The seeds possess diuretic properties, and in large doses cause vomiting and purging. In the form of a tincture, made by macerating an ounce of the seeds in sixteen fluid ounces of proof spirit, and given in doses of ten drops, gradually increased, it has been found useful in spasmodic asthma and dropsy. The properties and uses of this plant are probably closely analogous to those of *Delphinium Staphisagria.*

U. S. Disp., by W. & B., p. 359; Wicke, Journ. de Pharm., Juillet, 1854, p. 79, and in Pharm. Journ., vol. xiv, 1st ser., p. 278; Hopkins, in Amer. Journ. of Pharm., vol. xi, p. 8.

D.Blair F.L.S. ad sicc del et lith.

ACONITUM FEROX, *Wall.*

M & N Hanhart imp

N. Ord. RANUNCULACEÆ.

Tribe *Helleboreæ*.

Genus Aconitum,* *Linn.* B. & H., Gen., i, p. 9; Baill., Hist. Pl., i, p. 23. Species about 20, inhabitants of temperate and montane districts in both the old and new worlds.

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5. Aconitum ferox, *Wallich, in Seringe, Mus. Helv. d'Hist. Nat.*, i, *p.* 160 (1822).

Bish. Sringibish. Nepal Aconite.

Syn.—A. virosum, *Don.*

Figure.—Edinburgh New Philosoph. Journ., xlvii, t. 5.

Description.—A perennial herb, with a fusiform, fleshy, tuberous root-stock, attenuated below into the root, and giving off laterally, near the summit, one or two similar tubers. Stem reaching 6 feet in height, erect, stout, smooth below, finely hairy above, simple or branched in the upper part. Leaves alternate, the lower on long stalks, the upper on shorter ones, roundish in outline, deeply and palmately cut into 5 acute, irregularly indented lobes, glabrous and dark green above, paler and with prominent veins beneath, the upper ones passing insensibly into the bracts. Flowers large, on long, erect stalks, which are closely glandular-pubescent and thickened above, arranged in long, erect racemes; bracts at the base of the pedicels leaflike, gradually smaller upwards, cut or lobed, one or two smaller ones usually about half way up the pedicel. Sepals as in *A. Napellus*, but all glandular-hairy on the outside, the upper one somewhat less arched, and the lateral ones not hairy within, pale dirty blue. Petals as in last, but the terminal knob of the two posterior ones less recurved. Stamens as in *A. Napellus*. Carpels usually 5. Fruit of 5 follicles, tipped with the styles, erect, transversely wrinkled, strongly pubescent. Seeds black, with the testa pitted or plaited.

Habitat.—This, the true *A. ferox* of Wallich, is a native of the Himalaya Mountains, where it grows in the temperate and sub-

* *Aconitum, ἀκόνιτον*, the classical name for some plants of this genus.

alpine zones up to about 1300 feet of elevation in Nepal, Sikkim, Kumaon, &c., flowering in July and August.

In 1848 it was introduced into the Botanic Garden at Edinburgh, where it flowered in 1849, and was fully described by Professor Balfour in the memoir quoted below.

Indian botanists agree in giving this the rank of a species. The differences from some of the numerous forms of *A. Napellus* are not, however, very marked, consisting mainly in the less divided leaves, the usually more dense racemes, and the shorter beak to the helmet. The follicles are sometimes glabrous.

Other species besides the present and *A. Napellus* are found in the same region, *A. lucidum*, Hook. f. & Th., *A. palmatum*, Don., and *A. uncinatum*, L., and the poisonous roots of all are collected under the name of *Bish*.

Balfour, in Edinb. New Phil. Journ., xlvii (1849), p. 366; Hook. fil. & Th., Fl. Indica, p. 56; Fl. Brit. Ind., i, p. 28; Lindl., Fl. Med., p. 12.

Official Part and Name.—Aconiti Ferocis Radix; the dried root (I. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of the United States; the only species recognised in these volumes being Aconitum Napellus, *L.* The root of *Aconitum ferox* is commonly distinguished as *Nepal* or *Indian Aconite*. It is also known in the Indian bazaars under the name of *Bish* or *Bikh*, although, according to Hooker and Thomson, the roots of four other species of *Aconitum* are also collected indiscriminately in the Himalayas under the same name, namely, A. uncinatum, *L.*, A. lucidum, *H. f. et Th.*, A. palmatum, *Don.*, and A. Napellus, *L.* It seems clear, however, that Bish is chiefly obtained from A. ferox, *Wallich*.

General Characters and Commerce.—Nepal or Indian Aconite root is found in commerce of various sizes, that is, from 2 to 3 or even 4 inches long; and from ½ to nearly 2 inches in its greatest diameter. In form the roots are more or less conical or somewhat fusiform, when entire; but in consequence of their lower end having been broken off in being dug up, the two

extremities are sometimes nearly of the same diameter. They are mostly flattened, frequently somewhat arched, much shrivelled longitudinally, and marked here and there with the scars of small detached roots. They have a blackish-brown colour, except at their more elevated portions, where, in consequence of friction, they are sometimes whitish. When broken the fractured surface is generally very compact, hard, horny, somewhat translucent, and of various shades of brown in colour; but some roots are white and spongy. The latter are said by Headland to yield most aconitia, and to be therefore more active than the more hard and compact roots. They have no odour, and only a slightly bitter taste at first, but this is soon followed by a peculiar sense of numbness and tingling in the lips, cheeks, and tongue.

The roots are imported direct from India, sometimes in very large quantities, but the supply is irregular.

Composition.—The chemical constituents of Aconite root are especially described in our notice of *Aconitum Napellus;* but since that article was written some further investigations into the nature of its contained alkaloids have been made by Groves, Alder Wright, Duquesnel, and others, and the results of these and those previously obtained have been reported upon by a Committee appointed by the British Pharmaceutical Conference, from which it appears—(1) That the roots of *Aconitum Napellus* contain a very active crystallizable alkaloid termed *aconitine,* which readily furnishes crystallizable salts; also more or less of another active alkaloid called *pseudaconitine,* which is likewise crystallizable, but does not readily yield crystallizable salts; and further an apparently non-crystalline alkaloid, yielding non-crystalline salts, and of little physiological potency. Groves has also obtained on one occasion from a batch of aconite roots, besides *aconitine,* an entirely different base, not crystallizing itself, but giving well-crystallized salts. This base is comparatively inactive, and its salts bitter, but causing no tingling in the lips, &c., whence it has been named *picraconitine.* By the action of hot water, alkalies, and some acids, it also appears that aconitine can be split up into *benzoic acid,* and a substance which has been named *aconine;* it

is therefore a *benzoyl-aconine.* Aconine itself is an inert substance with a slightly bitter taste, but causing no tingling. In like manner pseudaconitine can be split up, but with different results, the products being the substance termed *dimethyl-protocatechuic acid,* and another called *pseudaconine.* (2.) That the roots of *A. ferox* contain comparatively large quantities of *pseudaconitine,* with a little *aconitine ;* and an alkaloid, apparently non-crystalline, and yielding non-crystalline salts, but seemingly not identical with the analogous body from *A. Napellus.* (3.) That the roots of *A. Lycoctonum* appear to contain both *aconitine* and *pseudaconitine ;* and the substances thence extracted by Hübschmann, and termed by him *acolyctine* and *lycoctonine,* were apparently simply alteration and decomposition products of aconitine and pseudaconitine in a more or less pure state. (4.) That the so-called aconitine of commerce is a mixture of true aconitine and pseudaconitine, with variable quantities of their alteration products, aconine and pseudaconine, and of the amorphous unnamed alkaloids above alluded to ; also that the *napelline* found by Hübschmann in the aconitine of commerce, and ascertained by him to be identical with his acolyctine, is doubtless simply one of those decomposition products, namely, aconine, in a more or less pure condition. (5.) Aconitine and pseudaconitine, although allied in physiological action, and to some extent in chemical characters, do not seem to have a common radical.

The chemical nature of Aconite root is still, however, in an incomplete state, and is undergoing further investigation by Dr. Wright, J. Williams, and T. B. Groves. Paul and Kingzett have also recently published a preliminary notice of the alkaloids of the root of a species of *Aconitum* derived from Japan ; and Dr. Paul states that the conclusion " at which they had arrived was, that they doubted whether the alkaloid to which the active properties of Aconite root are ascribed had ever yet been obtained in a separate state. In fact, it seemed probable that the substance extracted from Aconite was, to a great extent, a salt of an acid like aconitic acid."

Medical Properties and Uses.—The properties and uses of

aconite root are similar to those of the official aconite root of the British and United States' Pharmacopœias, and are described under "Aconitum Napellus." Indian aconite root is, however, generally believed to be much the more active of the two roots. It is largely used as a source of commercial aconitine.

As already noticed, these roots are sold, as also those of other species of *Aconitum*, in the bazaars of India, under the name of "Bish," a preparation of which is much used in the hilly districts in the north of India, to poison arrows for the destruction of wild beasts. It has been also employed to poison wells and tanks, and in other ways.

Pharmacographia, p. 12; Hooker & Thomson, Flor. Ind., vol. i, Introd., p. 3, and pp. 54 and 57; Groves, in Year Book of Pharmacy (1870), and Pharm. Jl., ser. 3, vol. i, p. 433; Flückiger, in Ph. Jl., ser. 3, vol. i, p. 121; Moodeen Sheriff, Supplement to Pharm. of India, pp. 25–32 and 265; Cooke, in Pharm. Jl., ser. 3, vol. iii, p. 563; Duquesnel, De l'Aconitine Crystallisé, Paris, and Pharm. Jl., ser. 3, vol. ii, pp. 602, 623, and 662; Groves, in Year Book of Pharm. (1873), p. 500, and Ph. Jl., ser. 3, vol. iv, p. 292; Gréhant and Duquesnel, Year Book of Pharm. (1872), p. 244, from Journ. Pharm. Chim., ser. 4, vol. xiv, p. 156; Alder Wright, Year Book of Pharm. (1876), p. 531, and Ph. Jl., ser. 3, vol. vii, p. 256; Report on the Extraction and Investigation of Aconitine, by T. B. Groves, J. Williams, and Dr. Wright, Pharm. Journ., ser. 3, vol. viii, p. 177.

DESCRIPTION OF PLATE.

Drawn from specimens in the British Museum, collected in Kumaon by Strachey and Winterbottom.

1. Portion of a plant with flowers and fruit.
2. Sepals separated.
3, 4. A posterior petal.
5. A lower leaf.

(4 enlarged.)

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6

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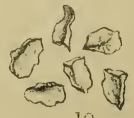
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D.Blair, ad nat. del. et lith.

M&N.Hanhart imp.

ACONITUM NAPELLUS, *Linn.*

N. Ord. RANUNCULACEÆ.

Tribe *Helleboreæ*.

Genus Aconitum,* *Linn.* B. & H., Gen., i, p. 9; Baill., Hist. Pl., i, p. 23. Species about 20, inhabitants of temperate and montane districts in both the old and new worlds.

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6. Aconitum Napellus,† *Linn., Sp. Plant., ed.* 1, *p.* 532 (1753).

Monkshood. Wolfsbane. Aconite.

Syn.—A. vulgare, *DC.* A. tauricum, *Jacq.* A. angustifolium, *Bernh.* A. multifidum, *Koch.* A. dissectum, *Don.* A. ferox, *Wall., in Pl. Asiat. rar.* (*not elsewhere*).

Figures.—Woodville, t. 165; Steph. & Ch., t. 23; Nees, t. 395, & Supp.; Hayne, xii, tt. 12–14; Berg & Sch., t. 28 f; Syme, E. Bot., i, t. 48; Reich., Ic. Fl. Germ., iv, t. 92; Wallich, Pl. Asiat. rar., t. 41.

Description.—An herbaceous perennial with a short fleshy rootstock or tuber tapering below, and passing insensibly into a long slender root, giving off numerous branches, skin dark brown or nearly black, interior white; from the upper part of the rootstock are given off one or more very short thick lateral shoots each of which developes at the end a new pale-coloured tuber with a terminal bud and passing below into a filiform root. Flowering stem solitary, stout, erect, 2—4 feet high, unbranched, smooth, slightly hairy above, green. Leaves alternate, long-stalked, spreading, very deeply cut palmately into 5 or 3 segments, which are again deeply and irregularly divided into oblong acute laciniæ, dark green and shining above, paler beneath and slightly hairy. Flowers large, not very numerous, stalked, forming an erect rather lax terminal raceme; pedicels erect, downy, thickened at the end, in the axils of short, lanceolate bracts, and with two smaller bracts close to each flower. Sepals 5, petaloid, very unequal, deciduous, imbricate, dark blueish-purple, the upper one large, helmet-shaped, laterally compressed, pointed,

* *Aconitum*, ἀκόνιτον, the classical name for some plants of this genus.

† *Napellus*, a name given in the middle ages, from the shape of the root being somewhat like a small turnip, *napus*.

longitudinally ridged with nearly parallel veins, the two lateral ones broadly ovate, blunt, hairy within, the two lower oblong or lanceolate, unequal. Petals 2—8, unequal, the two posterior enclosed in the hood of the posterior sepal, arched and of very peculiar form, consisting of a long curved stalk, supporting at the end a small inflexed tongue-like blade which is prolonged backwards into a rounded hollow knob which forms a recurved apex to the petal, the remaining ones usually some (or all) suppressed or abortive, very small, subulate, very similar to the filaments. Stamens numerous, hypogynous, filaments rather long, dilated below, slightly hairy, the outer ones drooping, anthers small, roundish, 2-celled, dull green. Carpels 3, quite distinct, shorter than the stamens, somewhat divergent, ovary oblong, smooth, with numerous ovules in 2 rows, styles tapering, stigma faintly bilobed. Fruit of 3 follicles, erect, dry, papery, veined, scarcely an inch long, compressed-cylindrical, beaked by the recurved styles, dehiscent down the ventral suture. Seeds numerous, angular, irregularly pyramidal, brown, the testa thick, with irregular prominences and excavations, embryo very small at the base of the abundant endosperm.

Habitat.—In one or other of its forms the Aconite grows throughout Europe, except the extreme north and the south-west, and is widely distributed also through temperate and subarctic Asia and North America. It is especially a plant of subalpine pastures and wet shady places in hilly districts, and is common in the Alpine chains of Europe and also in the Himalaya range, where it extends from 10,000 feet elevation up to the limit of vegetation. In this country it can scarcely be considered a native, but occurs by some rivers in the west of England in a semi-wild condition. For medicinal purposes Monkshood is not much cultivated, the root of the wild plant being collected, but as an ornamental garden plant it is very familiar; the singular flowers are expanded in July, and are occasionally pale blue or white.

The varieties of *A. Napellus* are very numerous, depending on locality and elevation. For the European forms, many of which

are described as species, reference may be made to Reichenbach's elaborate memoir on the genus, quoted below, which contains coloured folio plates of most of them. One of these, *A. Stoerkeanum*, Reichenb., an alpine plant, is considered a good species by Koch and other botanists; it is figured in Hayne, xii, t. 15, Nees, Supp., and Berg and Sch., t. 28 e; its roots are also collected for use.

In the Himalayas similar variety prevails; the forms are grouped under four varieties in the "Flora of British India," one of which, var. *rigidum*, is the plant erroneously figured in the "Plant. Asiat. Rariores" by Wallich as his *A. ferox*.

Syme, E. Bot., i, p. 64; Hook. f., Stud. Fl., p. 11; Watson, Comp. Cyb. Brit., p. 87; Koch, Fl. Germ. & Helv., ed. 2, p. 25; Gren. & Godr., Fl. de France, i, p. 51; Ledebour, Fl. Rossica, i, p. 69; Hook. f., Fl. Brit. Ind., i, p. 28; DC., Syst. Veg., i, p. 371; Reichenbach, Illust. Spec. Aconiti Generis (1823–27); Lindl., Fl. Med., p. 7.

Official Parts and Names.—1. Aconiti Folia; the fresh leaves and flowering tops, gathered when about one third of the flowers are expanded, from plants cultivated in Britain: 2. Aconiti Radix; the dried root, imported from Germany, or cultivated in Britain, and collected in the winter or early spring before the leaves have appeared: 3. Aconitia; an alkaloid obtained from Aconite (B. P.). 1. The fresh leaves and flowering tops, gathered when about one third of the flowers are expanded, from plants cultivated in Britain: 2. The dried root, collected in the winter or early spring before the leaves have appeared (I. P.). 1. Aconiti Folia; the leaves: 2. Aconiti Radix; the root (U. S. P.).

1. Aconiti Folia.—*Collection and Drying.*—In the British and Indian Pharmacopœias the fresh leaves and flowering tops are directed to be gathered when about one third of the flowers are expanded, for the reasons explained by us under *Digitalis purpurea*. When carefully dried the properties of Aconite leaves are not sensibly impaired at first, but they are deteriorated by long keeping; hence in those countries in which the plant cannot be readily obtained in a fresh state, as in the United States, where

it is not generally cultivated, the Pharmacopœia of that country directs the recently dried leaves to be used.

General Characters and Composition.—The fresh leaves have no marked odour, and but little taste at first, being merely herbaceous, and very slightly bitter; but after a short time they are persistently burning, and cause a remarkable feeling of tingling and numbness in the mouth and throat.

The principal constituents of aconite leaves are *aconitia* in small proportion; and *aconitic acid.* The experiments of Schoonbroodt also indicate the probable presence of the *aconella* of Smith. *Aconitic acid* is the same substance as described by Braconnot, under the name of *Equisetic Acid*, and by Baup, as *Citridic Acid.* The characters of Aconitia, and of the other constituents of aconite leaves, are described below under Aconiti Radix and Aconitia.

2. Aconiti Radix.—*General Characters and Composition.*—When fresh aconite root varies in length from 3 to 6 or even in rare cases 8 inches. In form it closely resembles that of the common parsnip, being broad at the base, and tapering downwards to a fine thread-like point; the upper extremity is generally about the thickness of the middle finger, but frequently an inch or more in diameter. It descends perpendicularly into the earth, giving off in its passage numerous cylindrical rootlets, each being about the thickness of a common knitting needle. Both the root and rootlets are coffee-coloured or dark brown externally; and whitish internally. The odour is merely earthy; and the taste at first only very slightly bitter, but in a few minutes a burning sensation and a peculiar feeling of tingling and numbness is perceived in the lips, cheeks, and tongue.

As is noticed under *Cochlearia Armoracia,* aconite root has, notwithstanding its marked difference of appearance, been substituted for horseradish root, and thereby caused several fatal cases of poisoning. To the distinctive characters of the two roots there given in a tabular form, we may add that a pinkish colour is soon developed on the scrapings of aconite root.

Aconite root is most active in the winter months and early spring, when the leaves are absent, and it is only at such times that it can be mistaken for that of horseradish; and it is at such periods also that it is ordered to be collected in the British Pharmacopœia. When dried, in which state it is alone official, it is distinctly conical in form, 2 or more inches long, and from ½ to 1 inch thick at its upper extremity, where it is crowned with the remains of the stem. It is much shrivelled longitudinally, and is more or less covered with the broken rootlets. Externally it has a dark brown colour, and is white or brownish internally; it breaks with a short fracture, the exposed surfaces commonly exhibiting a somewhat mealy character, and are sometimes hollow in the centre. In taste it resembles that of the fresh root. Aconite root is by far the most active part of the plant; it is said to have six times the strength of the leaves.

The essential constituent of aconite root is *aconitia*, which will be described presently; it is combined with *aconitic acid*. Three other alkaloids have also been indicated as constituents of aconite root, namely, *napelline*, *aconella*, and one which was supposed by Groves to be identical with *atisine*, an alkaloid discovered by Broughton in *Atees*, and which is alluded to by us under *Aconitum heterophyllum*. *Napelline* was discovered by Hübschmann in 1857, and he afterwards thought it was identical with *acolyctine*, one of the alkaloids he had found in the root of *Aconitum Lycoctonum*, L. Napelline is described as a white powder, with a bitter and burning taste, having a strong alkaline reaction; and readily soluble in water, alcohol, or chloroform, but insoluble in ether. The so-called *aconella* was discovered by T. and H. Smith, of Edinburgh, in 1864, but they afterwards found it to be identical with *narcotia* or *narcotine*, one of the constituents of opium. Groves, who has investigated with great care and ability the chemical composition of aconite, was never able to detect aconella in aconite root. The third alkaloid supposed by Groves to be identical with the *atisine* or *atisia* of Broughton, is said by Alder Wright to be a new base altogether. It is described as being far less poisonous than aconitia, producing no

pricking of the tongue, but having only a bitter taste and being almost inert. Amongst the other constituents of aconite root that have been indicated, are *mannite, cane sugar, resin,* and *fatty matter.*

3. Aconitia or Aconitine.—This alkaloid is the constituent to which all parts of the aconite plant owe their medicinal properties. It is a most virulent poison. Aconitia exists in both an *amorphous* and a *crystalline* form. English manufacturers commonly obtain aconitia from Nepal or Indian Aconite root, as this root is said to yield at least three times as much alkaloid as that of the English plant; it is described under *Aconitum ferox.* The aconitia obtained from Indian aconite root, like that derived from the official aconite root, occurs in two forms—*crystalline* and *amorphous,* but in their chemical characteristics, as noticed in the description of Indian Aconite root, they present certain differences from the corresponding forms obtained from *Aconitum Napellus.* The aconitia of the root of *Aconitum ferox* is therefore distinguished as *Pseud-aconitia* or *Pseud-aconitine;* it has also been termed *English Aconitine, Napelline* (Wiggers), *Nepaline* (Flückiger), and *Acraconitine* (Ludwig).

The characters of aconitia as obtained by the process of the British Pharmacopœia are as follows:—"A white usually amorphous solid, soluble in 150 parts of cold, and 50 of hot water, and much more soluble in alcohol and in ether; strongly alkaline to reddened litmus, neutralising acids, and precipitated from them by the caustic alkalies, but not by carbonate of ammonia or the bicarbonates of soda or potash. It melts with heat, and burns with a smoky flame, leaving no residue when burned with free access of air." According to Herapath, the average produce of *the fresh root collected after flowering,* is 8·58 grains of aconitia in the pound; of the same *root dried,* 35·72 grains: but if obtained *before flowering,* the yield is only 3·5 grains in the pound of fresh root; and 12·13 grains per pound in the dried root.

Medical Properties and Uses.—Aconite is a powerful sedative, anodyne, diuretic, and antiphlogistic; and in large doses a

virulent poison. Under the influence of aconite the force of the circulation is reduced, and the frequency of the respirations diminished; and in fatal doses there is loss of sight, hearing, and feeling, followed by convulsions, syncope, and death. Locally applied to a painful part, it first produces a tingling sensation, which is succeeded by numbness and the cessation of pain. In all cases whether taken internally, or used as an external application, it appears at first to cause contraction of the pupil of the eye, and subsequently it is said dilatation. So far, however, as the alkaloid aconitia is concerned, Dr. John Harley says, that in poisonous doses, the pupil may be slightly dilated, or in the severer forms of poisoning contracted.

Aconite has been given internally in acute and chronic rheumatism, gout, and neuralgia; many painful affections of the heart, as angina pectoris, hypertrophy, and nervous palpitations; to relieve pain in carcinomatous affections; as an antiphlogistic in various inflammatory diseases, as pleurisy, pericarditis, pneumonia, erysipelas, and cynanche tonsillaris. Dr. Sidney Ringer, indeed, believes that if given sufficiently early, and in constantly repeated minute doses, it can cut short and limit the intensity of most acute inflammations. As a diuretic it is often given with benefit in dropsies. Notwithstanding the undoubted beneficial effects of aconite, it is but little employed internally, except by a few practitioners, a result probably due in a great measure to the dangerous symptoms of depression which sometimes ensue from its use; hence its action should in all cases be carefully watched; moreover, its effects are said to be only very temporary. Externally applied in the form of the official liniment, or of the liniment combined with chloroform, it is often of great value in different forms of neuralgia, and in chronic rheumatism; but care must be taken not to apply it to abraded surfaces, lest its too rapid absorption under such circumstances should produce poisonous symptoms.

The effects of aconitia are similar to those of aconite root and aconite leaves, although of course much more powerful. It is rarely, however, administered internally, on account of its power-

fully poisonous properties; but of its great efficacy when used externally in the form of the official ointment, in neuralgic and rheumatic affections, no one who has submitted it to trial can entertain a doubt. Dr. John Harley prefers the alkaloid in all cases, whether for internal or external use, or for subcutaneous injection; thus he says, "So long as the pure alkaloid can be obtained, the other preparations of aconite are not only superfluous but mischievous, for it is impossible to prepare them from year to year of uniform strength."

Per. Mat. Med., vol. ii, pt. 2, p. 687; Per. Mat. Med., by B. & R., p. 998; Pharmacographia, pp. 9–12; U. S. Disp., by W. & B., pp. 72 & 985; Garr., Mat. Med., p. 181; Royle's Mat. Med., by J. Harley, p. 773; Gmelin's Chemistry, vol. ii (1857), p. 402; Bentley, in Pharm. Journ., vol. xv, 1st ser., p. 449; Wittstein's Vierteljahresschrift, vol. xviii (1869), p. 82; Groves, in Pharm. Journ., vol. viii, 2nd ser., pp. 118 and 121, and Oct. 11, 1873, pp. 293–296; Groves, in Year Book of Pharmacy for 1874, p. 507; Wright, in Year Book of Pharmacy for 1875, p. 514; T. & H. Smith, in Pharm. Journ., vol. v, 2nd ser., p. 317; Flückiger, in Pharm. Journ., vol. ii, 3rd ser., p. 121; Garrod, in Med. Times and Gaz., Feb., 1864, p. 146; Hottot, in Journ. de Pharm., April, 1864.

DESCRIPTION OF PLATE.

Drawn from a plant in the Royal Gardens, Kew.

1. The summit of the flowering stem.
2. The base of the stem, showing the rootstock and young tubers.
3. The sepals separated.
4. Section to show the upper petals.
5. Section of flower, the sepals removed.
6. A stamen.
7. Stigma.
8. Transverse section of the ovary.
9. The fruit.
10. Seeds.
11. A seed.
12. Vertical section of the same.

(5–8, 11, 12, enlarged).

J.R.Lace FLS ad nicc del et lith.

M & N. Hanhart imp.

ACONITUM HETEROPHYLLUM, *Wall.*

N. Ord. Ranunculaceæ.
Tribe *Helleboreæ*.
Genus Aconitum, *Linn.*

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7. Aconitum heterophyllum, *Wallich, List of E. Indian plants'* no. 4722 (1828).

Atís, Atees.

Syn.—A. cordatum, *Royle.* A. Atees, *Royle.*

Figures.—Royle, Illust. Bot. Himalaya, t. 13; Bot. Mag., t. 6092.

Description.—A perennial herb with an oblong-ovoid or fusiform perpendicular rootstock, pale grey externally, white within, and with numerous spreading fibrous roots. Stem erect, 1—3 feet high, erect, simple, or slightly branched, smooth and somewhat angled below, cylindrical and pubescent above. Leaves numerous, variable, the lower ones on long petioles, reniform, or roundish in outline, with a cordate base, more or less deeply 5-lobed, the lobes deeply and irregularly inciso-crenate, the upper ones very shortly stalked or sessile, amplexicaul, narrowly ovate with a cordate base and acuminate apex, strongly inciso-serrate, all quite glabrous, rather thick, bright green, paler beneath. Flowers large, on long rufous-pubescent petioles closely appressed to the stem and thickened at the ends with a leaflike cordate acuminate bract at the base and two rather large, oblong, membranous, entire, sub-opposite bracteoles, generally about $\frac{1}{3}$ below the flower, arranged in a (usually) rather dense erect raceme. Sepals much as in the other species, but the upper one boat-shaped and less hooded, the lateral ones obliquely ovate, smooth on the inside, and the anterior ones small, oval, pendulous, all pubescent on the exterior, pale yellowish green with purple veins or all bright blue. Posterior petals with a thick dorsal black slightly incurved knob, with an inferior membranous appendage but no backward spur. Stamens and carpels as in the other species. Fruit of 5 follicles, pericarp papery, slightly veined,

minutely downy. Seeds large, irregularly angled, smooth or somewhat wrinkled, bright brown.

Habitat.—This species of Aconite is a native of the Western Himalayas, and is found in Gurhwal, Kumaon, and Kashmir, in the temperate zone of about 9000 to 10,000 feet, or somewhat higher. It is a handsome plant, and grows in moist places near the borders of forests. It has been grown in this country from seed.

Though itself a variable plant, this is completely distinct from the species above described. The flowers vary much in colour; Royle figures them dark purplish-blue, whilst the plate in the 'Bot. Mag.' shows them pale yellowish-green, with dark-purple borders to the sepals.

Hook. fil. & Th., Fl. Indica, p. 58; Fl. Brit. Ind., i, p. 29; Royle, Illustr. Ind. Bot., p. 56.

Official Part and Names.—Aconiti Heterophylli Radix; the dried root (I. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of the United States. It is sold in the bazaars of India under the name of *Atís* or *Atees*.

General Characters and Composition.—The dried roots are ovoid-conical in form, tapering downwards to a point, from half an inch to an inch and a half or more in length, and from about one third of an inch to half an inch or more in thickness. Their weight is given by Flückiger and Hanbury as varying from five to forty-five grains. Externally they have a greyish or light ash colour; their surface is slightly wrinkled longitudinally, and marked here and there with whitish scars of small detached roots; and their upper extremity bears the scaly remains of leaves. A transverse section shows the root to consist of a pure white, friable, amylaceous substance, marked towards the centre by from 4 to 7 concentrically arranged yellowish dots, which are the ends of the fibro-vascular bundles traversing the root longitudinally. The root has no odour, but a pure bitter taste, without acridity or astringency. No complete analysis of Atís has been made, but its physiological action as exhibited by its use in medicine

proves the absence of *aconitia*. From information communicated to the authors of Pharmacographia by Broughton, it appears that he has discovered in it a well-defined alkaloid of an intensely bitter taste, which has been termed *atisia* or *atisine*, and upon which its properties essentially depend.

Substitutes.—Besides the official root, several other drugs are also sold in the bazaars of India under the name of *Atís*. One of these, which was first noticed by O'Shaughnessy, is tasteless and inert, and is said to be the root of *Asparagus sarmentosus*, L. From this and some other varieties of *Atís*, the official drug is at once distinguished by its pure bitter taste, whiteness and farinaceous nature of its internal substance, and the concentrically arranged dots seen on a transverse section. But Moodeen Sheriff has also described a root which is found in the bazaars of Southern India, under the name of *Ati-vasa*, which he regards as a variety of *Aconitum heterophyllum*. He describes it as "a small tuberous root, from one to two inches in length and circumference, conical or ovoid, with a tapering point towards one end; grey externally, and white internally, with more or less white scars of rootlets on the surface; inodorous, and bitter in taste, without any acridity or astringency." On comparing this with specimens of Atís from Calcutta and other places, he found it to correspond exactly with them in taste and internal appearance, but differed from some of them in colour and form. On examining other specimens of this variety of Atís he found them all to differ in some minor characters, but to agree with the official drug in their bitterness, and in the farinaceous nature and whiteness of their internal substance. Hooker and Thomson state on the authority of Munro, that in Kunawar, the roots of *Aconitum Napellus* are dug up and eaten as a tonic, the name *atís* being applied to them also. It seems clear that some other species of Aconite has been mistaken in this case for *A. Napellus*, as there is no evidence of this plant becoming innocuous when growing in particular localities; indeed, the recent investigations of Schroff prove the contrary.

In the bazaars of India, the roots of other species of Aconite

are also to be met with under the Hindustani name *Nirbisi,* and the Arabic *Jadvar,* which resemble in their characters and properties the roots of *Aconitum heterophyllum.*

Medical Properties and Uses.—The evidence of the tonic and antiperiodic properties of this drug given by medical practitioners in India, although somewhat conflicting in certain cases, is upon the whole so strong, that its reputation must be regarded as established. Its properties have never been tested in this country, but deserve a careful investigation. Waring says, that the best form of administration is the powder, which should be given in intermittent and other paroxysmal fevers in doses of from twenty to thirty grains every three or four hours irrespective of the presence of pyrexia. As a simple tonic in convalescence after debilitating diseases and in other cases where a pure tonic is required, the dose is from five to ten grains three times a day.

Waring, Pharmacopœia of India, pp. 4 and 434; Bengal Dispensatory (1842), p. 167; Pharmacographia, p. 15; Hooker and Thomson, Flora of British India (1855), p. 58; Pharm. Jl., vol. xvi, ser. 1, p. 311; Proc. Agri.-Hort. Society of India (1857), vol. ix, part 3, p. 271; Moodeen Sheriff, Suppl. to Pharm. of India, p. 28; Cooke, Pharm. Jl., ser. 3, vol. iii, p. 601; Schroff, in Amer. Jl. Pharm., Sept., 1875, and Pharm. Jl., ser. 3, vol. vi, p. 222, from Zeitschr. d. Œst. Apoth. Ver. (1875) Nos. 19 and 20.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Kew Herbarium, collected in Gurhwal by Falconer.

1. A raceme of flowers.
2. Sepals, separated.
3, 4. A posterior petal.
5. Fruit.
6. A lower leaf.

(4 enlarged.)

DBlair FLS ad nat del et lith.

CIMICIFUGA

MOSA. *Elliott.*

M & N. Hanhart imp

N. Ord. RANUNCULACEÆ.

Tribe *Helleboreæ*.

Genus Cimicifuga,* *Linn.* B. & H., Gen., i, p. 9. Baill., Hist. Pl., i, p. 56. Species 8 or 9, natives of N. Asia, N. America, and Japan.

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8. Cimicifuga racemosa, *Elliott, Bot. Carolina,* ii, *p.* 16 (1824).

Bugbane. Black Cohosh. Black Snakeroot.

Syn.—Actæa racemosa, *Linn.* A. monogyna, *Walt.* Cimicifuga Serpentaria, *Pursh.* Macrotys actæoides, *Raf.*

Figures.—Nees, t. 398; Dillenius, Hort. Eltham., i, t. 67; A. Gray, Ill. Gen. N. Amer., t. 20.

Description.—A perennial herb with a short, thick, horizontal rhizome, sending up numerous stems and giving off below copious long cylindrical roots, much branched, dark brown, marked with the scars of fallen scales. Stem 5 or 6 feet high or more, erect, unbranched below the inflorescence, cylindrical, smooth. Leaves 2 or 3, the lower very large, but the upper much smaller, alternate, on stout cylindrical somewhat stem-clasping petioles, compound, at first ternate, each primary division bipinnate, pinnæ opposite, gradually shorter, leaflets stalked or nearly sessile, 1—3 inches long, ovate, acute, sharply serrate, the terminal one largest, more or less deeply 3-lobed, thin, smooth, shining, pale and often slightly downy beneath. Flowers very numerous, nearly ½ inch wide, on slender horizontal pedicels about ¼ inch long, contiguous but not crowded on the straight, thick, pubescent rachis, and forming an erect raceme of 9 or 10 inches long, bracts subulate, nearly half the length of the pedicels, buds slightly drooping, globular. Sepals 4, very quickly falling, decussate, rounded, concave, faintly 3-veined, smooth, white, brownish green on the back, the two inner narrower. Petals none. Stamens very numerous, hypogynous, free, filaments, long, white, filiform,

* From *cimex*, a bug, and *fugare*, to drive away; from the use of *C. fœtida* in Siberia and Kamptschatka.

spreading, some of the outer ones petaloid or without anthers and flattened and bifid at the top, anthers small, 2-celled, adnate, with a wide commissure, dehiscence marginal, pale cream-coloured. Ovary flasked-shaped, white, glabrous, except a tuft of hair at the base of the ventral surface, not half as long as the stamens, 1-celled, with about 10 sessile ovules in two rows, no style, stigma sessile on the ventral side of the summit. Fruit a small follicle about $\frac{1}{4}$ inch long, ovoid, somewhat compressed laterally, the apex curved over the dorsal side, pericarp leathery, smooth, wrinkled, with a few prominent horizontal veins, yellowish-grey, dehiscent along the ventral suture. Seeds triangular in transverse section, straight along the sharp inner edge, very convex on the broad back, narrowly winged at the margins; embryo minute in the base of the abundant endosperm.

Habitat.—A frequent plant in the United States of America extending south to Florida; it is found also in Canada and Newfoundland; in the upper parts of Carolina and Georgia it is very abundant. The plant flowers in June and July, and the long white racemes are very conspicuous in the woods where it grows. The scent of the flowers is not unlike that of meadow-sweet, but is considered unpleasant by some people.

The Bugbane is grown in most botanic gardens; it was introduced into England early in the eighteenth century.

A. Gray, Man. Bot. U. States, p. 48; Hook., Fl. Bor.-Am., i, p. 27; Chapman, Fl. South. States, p. 11; DC., Syst. Veg., ii, p. 383.

Official Part and Name.—CIMICIFUGA; the root (U. S. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of India.

Collection and Commerce.—Cimicifuga, or Black Snakeroot as it is commonly called, should be collected for medicinal use in autumn, as it is most active at this period of the year. It is imported from the United States.

General Characters and Composition.—The so-called root, as imported in a dried state, generally consists of the entire rhizome

or of portions of the same, from which a variable number of rootlets arise below; or the latter are found separated from the rhizomes and mixed with them; or in some specimens the rootlets are almost entirely absent. The *rhizomes* vary from about one third of an inch to an inch in thickness, their average diameter being about half an inch; their length varies from one to several inches, usually being from two to three inches. They have a somewhat flattened cylindrical form, and are more or less twisted; and when of any size are furnished above with projections sometimes an inch or more in length, which are the remains of the aërial stems; they are also marked at intervals with the scars of fallen leaves. In colour externally, they are dark brown or blackish; internally they are whitish or yellowish, or sometimes with a darker central portion. They break with a close, somewhat resinous-looking fracture; and exhibit upon a transverse section, a large, central, pulpy or horny, whitish pith, around which are disposed one or more annular layers of coarse, more or less stellately-arranged, woody bundles, separated by large medullary rays; and outside them a hard thickish bark. In the dried state they have scarcely any odour, except when bruised or moistened with boiling water, when they possess a slightly narcotic one; but in a fresh state, or when recently dried, they have a peculiar, heavy, narcotic odour, somewhat resembling a mixture of aconite and liquorice roots. The fresh and recently dried rhizomes have a bitter, slightly acrid, and somewhat astringent taste; but if they have been long kept, these qualities are less evident. The diminished odour and taste of the long dried rhizomes lead to the conclusion that they are less active than when recently dried, or when in a fresh state, and this is fully borne out by the more satisfactory results obtained by the administration of the latter as remedial agents.

The *rootlets*, which are, according to our experience, more powerful than the rhizomes, vary in length from one to several inches; in the latter case, when numerous, they form an interlacing and somewhat twisted tuft. Their average size is about that of a common knitting needle. They are smooth or irregularly striated

externally, and of a blackish-brown colour; they present a close, somewhat resinous fracture, and consist of a dark cortical portion surrounding a whitish central part or meditullium. The lighter coloured woody bundles or wedges of the meditullium radiate from the centre, and are arranged in a stellate, cross-like, or triangular manner, according to their number. In odour and taste they resemble the rhizomes. The stellate or cross-like arrangement of the woody wedges of the rootlets is one of the best characters to distinguish them from other rootlets. In this particular they closely resemble the rootlets and rhizome of *Actæa spicata,* which are frequently substituted for those of black hellebore, as described by us under *Helleborus niger.*

The analysis of cimicifuga by Tilghmann in 1834 showed it to contain *gum, starch, sugar, resin, tannic* and *gallic acids, colouring matters, various salts,* and some other unimportant substances. A subsequent analysis by Davis indicated the presence of a small proportion of *volatile oil,* having the peculiar odour of the rhizome; and *two resins,* one soluble in alcohol but not in ether, and the other soluble in both these menstrua. More recently, Conard has denied the existence of any volatile principle; but he found a neutral crystalline substance of an intensely acrid taste, insoluble in water, but sparingly soluble in ether, and readily soluble in alcohol or chloroform. Its composition was not determined, nor its therapeutic properties. The substance called by the eclectic practitioners in the United States *cimicifugin* or *macrotin* is an impure resin, which is precipitated from the concentrated tincture of cimicifuga by the addition of water.

Cimicifugin is found in the form of a dark brown powder or in scales, and, according to Parrish, occurs in black snakeroot in the proportion of nearly 4 per cent. The sources of the activity of cimicifuga have not, as yet, been fully determined, but to a great extent, at least, they are owing to this so-called cimicifugin. The active properties of cimicifuga are taken up by water and alcohol, but alcohol is the best solvent; hence this drug is usually prescribed in the form of tincture.

Medical Properties and Uses.—The action of cimicifuga has

not been fully ascertained. By some it is regarded as a stimulant expectorant; but it would appear more properly to belong to the class of arterial and nervous sedatives. Dr. John Harley says that "in action it resembles hellebore on the one hand and colchicum on the other, full doses causing vomiting, relaxation of the bowels, giddiness, and headache, attended by reduction of the pulse." It has long been regarded as a valuable remedy in the United States in acute rheumatism and chorea. Sir James Simpson, of Edinburgh, first brought it into notice in this country, and he has spoken most favorably of its use in these diseases and in other affections. He states that in his own case he found it repeatedly cure an attack of lumbago with wonderful rapidity. Other practitioners in this country have also testified to its value in acute rheumatism. Cimicifuga has also been given with, it is said, good effect, in the early stages of phthisis, chronic bronchial diseases of old persons, epilepsy, dropsy, certain uterine disorders, hysteria, nervous headache, &c. It has, however, no value as a remedy in snakebites, as one of its popular names would imply. A concentrated tincture of cimicifuga has of late years been recommended in the United States as a valuable external application for the purpose of reducing inflammation. It is stated to be far more efficacious than tincture of arnica.

Per. Mat. Med., vol. ii, pt. 2, p. 696; Per. Mat. Med., by B. & R., p. 1010; Pharmacographia, p. 16; U. S. Disp., by W. & B., p. 260; Wood's Therapeutics and Pharmacology, vol. ii, p. 166; Stillé's Therapeutics and Mat. Med., vol. ii, p. 472; Royle's Mat. Med., by J. Harley, p. 780; Bentley, in Pharm. Journ., ser. 2, vol. ii, p. 460; Amer. Journ. Pharm., vol. xxxiii, p. 396, and vol. xliii (1871), p. 151; Conard, in Pharm. Journ., vol. i, ser. 3, p. 866; Close, in Proc. Amer. Pharm. Assoc., vol. xix, p. 488; and Year Book of Pharmacy, for 1872, p. 385.

DESCRIPTION OF PLATE.

Drawn from a plant cultivated in the Royal Gardens, Kew. 1. The whole plant, about $\frac{1}{8}$ nat. size. 2. Rhizome. 3. Portion of a leaf. 4. A raceme of flowers. 5. Inner—6. Outer sepal. 7. Petaloid stamen. 8. Pistil and half the stamens. 9. Anthers. 10. Pistil. 11. Vertical, and—12. Transverse section of the same. 13. Raceme of fruit. 14, 15, 16. A fruit. 17, 18. Seeds. 19, Vertical section of the same.

(5–9, 11, 12, 14–16, 18, 19 enlarged.)

M&N Hanhart imp

XANTHORHIZA APIIFOLIA, *L'Herit*

N. Ord. RANUNCULACEÆ.

Tribe *Helleboreæ*.

Genus Xanthorhiza,* *Marshall.* B. & H., i, p. 9; Baill., Hist. Pl., i, p. 79. The only species is the following.

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9. Xanthorhiza apiifolia, *L'Heritier, Stirp. Nov., fasc.* 4, *p.* 79 (1785).

Yellow-root. Shrub Yellow-root.

Syn.—X. simplicissima, *Marshall* (1785).

Figures.—Barton, t. 46; L'Herit., Stirp. Nov., t. 38; Bot. Mag., t. 1736; A. Gray, Ill. Gen. U. States, t. 17.

Description.—A low shrub about 2 feet high, with a large root-stock sending up numerous slender cylindrical, slightly branched stems growing chiefly by large terminal buds; bark smooth, shining, grey, ringed with the leaf-scars, bright yellow beneath. Leaves alternate, closely placed and forming a tuft at the extremities of the stems, without stipules, on very long stalks, spreading, 4—6 inches long, imparipinnate; leaflets opposite in two pairs, the distal pair often confluent with the terminal leaflet, rhomboid-ovate or -lanceolate, sessile, tapering at base, acute at apex, deeply incised and also finely serrate on the margin, glabrous, dark green above, paler beneath, petioles slender, dilated and stem-clasping below. Flowers small, stalked, numerous, racemosely arranged on the branches of elegant drooping panicles 3—5 inches long from the axils of the lower leaves of the tuft; bracts slender, subulate. Sepals 5, petaloid, deciduous, spreading, equal, ovate-acuminate, brownish-purple. Petals 5, very small, equal, with a short claw and dilated 2-lobed blade, rather darker than sepals. Stamens 5 (or 10), alternate with the petals, erect, hypogynous, filaments thick, purple, anthers adnate. Carpels 5 to 10, distinct, sessile, smooth, ovary tapering into style, with 2 pendulous ovules attached to the middle. Fruit (not seen) a cluster of oblong

* *Xanthorhiza*, ξανθός, yellow, and ῥίζα, a root. It is incorrectly spelt *Zanthorhiza* by L'Heritier, who is, however, followed by many writers.

somewhat compressed gibbous follicles with the remains of the style become lateral from one-sided growth of the pericarp, dehiscent along ventral suture. Seed solitary, pendulous from the top of the cavity; embryo minute, embedded at one end of the abundant fleshy endosperm.

Habitat.—This dwarf shrub is found in shady places on the banks of streams in hilly country in the United States of America from Pennsylvania southwards to Florida, especially in Carolina. The panicles of flowers (often polygamous) are produced along with the young leaves in April and May.

It was introduced in this country in 1766, and is grown in a few botanic gardens. It is scarcely hardy and liable to be killed by frost.

The specific names *apiifolia* and *simplicissima* being published in the same year, either is available, and we have preferred the former as more descriptive and in more general use.

A. Gray, Man. Bot. U. States, p. 47; Chapman, Fl. South. States, p. 11; DC. Syst. Veg., p. 386; Lindl., Fl. Med., p. 12.

Official Part and Name.—XANTHORRHIZA; the root (U. S. P. *Secondary*). It is not official in the British Pharmacopœia or the Pharmacopœia of India.

Collection.—It should be collected for medicinal use late in autumn, or early in the spring. The root is the most active part of the plant, and is alone official in the Pharmacopœia of the United States; but the stem possesses similar, although less powerful, properties.

General Characters and Composition.—The root, as found in commerce, has a very irregular appearance, being commonly much twisted and knotted, and more or less branched; and in some specimens a portion of the stem may be found attached. It varies in length from about two to twelve inches or more; and in thickness from the size of a common knitting needle to that of the ring or middle finger. It consists of a thin, easily separable, yellowish-brown, cortical portion; and a central yellow woody axis or meditullium, hence the common name of *yellow-root* which

is applied to it. The surface of the cortical portion is nearly smooth, with irregular longitudinal furrows; this part may be readily separated into two layers, the external of which has a yellowish-brown, and the internal a deep yellow, colour. The meditullium has a bright yellow colour, and is marked on its surface by a number of irregular, more or less twisted, longitudinal elevations, from the projection of its constituent woody bundles. A transverse section shows a central pith, and large medullary rays, so that in some specimens the woody bundles may be found separated from each other. The fracture is more or less fibrous. The root has no marked odour; but it has a pure and intense bitter taste, resembling quassia and calumba. This bitter taste is by far the most marked in the cortical portion, which is evidently the most active part of the root. Hence in selecting pieces of the root for use in medicine, those should be chosen which are of moderate size, as in such specimens the bark is in greater proportion to the meditullium than in the smaller or larger pieces.

No complete analysis of this drug has been published. Neither the solutions of the persalts of iron or gelatine produce any very marked effects when added to an infusion of the root, hence it is clear that it can only contain tannic acid in very small proportion. The most interesting constituent is the alkaloid *berberia* or *berberine*, which was first found in it by J. Dyson Perrins. The virtues of the root appear, therefore, to be essentially due to berberia. The amount of berberia is, however, but small; seven pounds avoirdupois of root yielding Perrins only fifty-two grains of the pure nitrate of this alkaloid. *Berberia* derives its name from having been originally found in the common barberry (*Berberis vulgaris*); it is a crystalline alkaloid of a yellow colour, bitter taste, without odour, and forming with vegetable acids soluble salts of a yellow colour.

Medical Properties and Uses.—As already noticed, yellow-root has the same pure bitter taste as quassia and calumba; it may be employed therefore in the same manner and for the same purposes as these and other simple tonic bitters. Similar preparations

may be also made from it as ordered for calumba and quassia, and these may be used in the same doses.

Besides its use in medicine, this root has also been employed from the earliest periods by the Indians of the southern parts of North America, as a yellow dye.

U. S. Disp., by W. & B., p. 900; Wood's Therapeutics and Pharmacology, vol. i, p. 227; Watt's Dict. Chem., vol, i, p. 579; Fleitmann on Berberine, Chem. Gaz. (1847), vol. v, p. 129; Bentley, in Pharm. Journ., vol. iv, ser. 2, p. 12; Perrins, in Pharm. Journ., vol. iii, ser. 2, p. 567.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Royal Gardens, Kew; the fruit added from A. Gray.

1. End of a branch with leaves and flowers.
2. A flower.
3. The same seen from above.
4. A sepal.
5. Petals.
6. Stamens.
7. The carpels.
8. A separate carpel.
9. Fruit.
10. A single follicle.
11. A seed.
12. Section of the same.

(2–8, 10-12, enlarged.)

J. Blanc ad nat. del. et lith.

M&N Hanhart imp.

ILLICIUM ANISATUM, *Lour.*

N. Ord. MAGNOLIACEÆ. Lindl., Veg. K., p. 417; Le Maout & Dec., p. 192; Baill., Hist. Pl., vol. i.

Tribe *Wintereæ*.

Genus Illicium,* *Linn.* B. & H., Gen., i, p. 18; Baill., l. c., p. 183. Species 5, natives of Asia and North America.

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10. Illicium anisatum,† *Linn., Sp. Plant, ed.* 2, *p.* 664 (1764).

Star-Anise. Skimmi (Japan).

Syn.—I. religiosum, *Siebold & Zuccarini.*

Figures.—Nees, t. 371; Hayne, xii, t. 29; Berg & Sch., t. 30 f; Bot. Mag., t. 3965; Sieb. & Zuccar., Fl. Japon., i, t. 1; Miers, Contrib. Bot., i, t. 27 c; Baill., Hist. Pl., i, figs. 195–199.

Description. — A small tree reaching about 20 feet high, much branched, with smooth, round branches, young twigs marked with the scars of fallen leaves and spotted with brown. Leaves evergreen, alternate, rather crowded, without stipules, stalked, lanceolate or oblong-lanceolate, tapering and pointed at both ends, quite entire, smooth, shining, thick, with minute pellucid dots, the lateral veins scarcely visible, 2—3 inches long, on the young shoots much larger, 5—6 inches long. Flowers on the young shoots of the year apparently terminal, afterwards axillary, and sometimes coming from the old wood, solitary, or in clusters of threes, shortly stalked, the pedicel surrounded at the base with about six rounded, slightly ciliated bracts, faintly sweet-scented. Sepals 3—6, roundish, caducous, membranous, petaloid, imbricated. Petals about 24 (but varying in number), imbricated in three or more series, spreading, narrow-oblong, blunt, gradually smaller towards the centre, deciduous, pale greenish-yellow. Stamens indefinite (often about 16 or 20) in several rows, hypogynous; filaments thick, short, dilated; anthers adnate, introrse, dehiscing laterally. Carpels 5—15 (often 8) in a single whorl, free, erect, compressed, 1-celled; style

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* *Illicium*, an allurement, from the odour and attractive appearance.

† *Anisatum*, from the scent of the fruit, like Anise.

slender, short, slightly recurved, with the brownish stigma on its ventral surface. Fruit consisting of 8 or more coriaceous-woody, wrinkled, boat-shaped, more or less beaked, orange-brown follicles arranged in a radiated, spreading circle, and attached by their bases to a central axis, dehiscing along their ventral (upper) margin by a broad chink, internally bright yellow and shining. Seed solitary, in a cavity scooped out in the lower part of the carpel, attached to the axis, ovoid, compressed, polished and shining, hilum large, embryo very small, immersed in the abundant endosperm near the hilum.

Habitat.—This shrub is planted in the neighbourhood of the temples in Japan and is cultivated in China. In the former it was first collected by Kaempfer and Thunberg, in the latter by Loureiro. The plants of the two countries have been considered to be different species in consequence of the fruits of the Japanese tree being somewhat less rough, and having a sharper and more recurved beak. It is now, however, generally held (Miquel, Baillon) that the differences are of but little value. As cultivated in England, where it was introduced in 1842, it is found to vary in the size of the flowers and leaves. It produces abundance of its pretty scented blossoms from January to April, and sometimes also in the autumn.

Kaempfer, Amœn. Exotic. (1712), p. 880; Loureiro, Fl. Cochin, i, p. 353; DC. Syst. Veg., i, p. 441; Adansonia, viii (1867), p. 1; Franchet & Savatier, Enum. Pl. Jap., i, p. 15; Lindl., Fl. Med., p. 25.

Official Parts and Names.—Oleum Anisi; the oil distilled in Europe from the fruit of Pimpinella Anisum, *Linn.*, and the oil distilled in China from the fruit of Illicium anisatum, *Linn.* (B. P.). The fruit (*Star Anise*) (I. P.) Not official in the United States Pharmacopœia; the official oil of anise being there directed to be obtained from Pimpinella Anisum only.

1. The Fruit.—The fruit of *Illicium anisatum* is commonly termed Star-Anise, from its stellately-arranged carpels. In its

dried state, as seen in commerce, it is composed of generally 8, or rarely 9 or more carpels, which are arranged nearly horizontally in a single row, and diverging from one another from the short central column, to which they are attached, in a star-like manner. This central column is commonly placed upon a short, more or less oblique stalk or pedicel. Each carpel is boat-shaped, more or less beaked at its apex, irregularly wrinkled below, of a rusty or reddish-brown colour, and commonly split open on its upper margin, so as to expose the solitary seed which it contains. The seed is nearly oval in shape, oblique at the base, somewhat compressed, smooth and shining, and of a brownish-red colour. Star-anise has a pleasant aromatic odour and taste, resembling a mixture of fennel and anise. Flückiger and Hanbury state that the seeds are not aromatic, but this does not accord with our experience, for we find them distinctly so in commercial specimens. Star-anise is imported into Europe, the United States, and India, from China. Formerly it was brought to Europe by way of Russia, and hence the names by which it was then designated, *Cardamomum Siberiense* and *Anis de Sibérie.*

2. Oleum Anisi. *Oil of Anise.*—In the British and Indian Pharmacopœias, as above noticed, oil of anise is directed to be obtained from the fruit of the plant now under notice, and from the fruit of *Pimpinella Anisum ;* while in the United States Pharmacopœia the oil from the latter plant is alone official. Oil of Star-Anise is sometimes known as *Oleum Badiani.* It is imported from China. The amount of volatile oil which may be obtained from star-anise has been variously stated at from 2·3 to 5 per cent. ; the average quantity being probably about 4 per cent. In its general characters and composition it closely resembles the oil of anise obtained from the fruit of *Pimpinella Anisum ;* indeed, Flückiger and Hanbury say, "We are unable to give characters by which they can be discriminated, although they are distinguished by dealers." Oil of Star-anise is now largely used in this country in place of the European oil of anise, and in the United States of America, although not official, as already mentioned, it is said to have almost entirely superseded the latter oil, to which it is by

many regarded as much superior. The general characters and composition of oil of anise are described under *Pimpinella Anisum*.

Medical Properties and Uses.—The medical properties and uses of oil of anise are given under *Pimpinella Anisum*.

Star-Anise fruit is much esteemed in India and China. It is a great deal employed on the Continent, more especially in Italy, France, and Germany, to flavour spirits.

Per. Mat. Med., vol. ii, pt. 2, pp. 163 and 677; Pharmacographia, p. 20; U. S. Disp., by W. & B., p. 1303; Ph. Jl., vol. v, 2nd ser., p. 484.

DESCRIPTION OF PLATE.

Drawn from a plant at Kew Gardens in flower in January; the fruit from Chinese specimens in the British Museum.

1. A flowering branch.
2. Vertical section of flower.
3. Back, and—4. Front view of stamens.
5. Pistil and receptacle.
6. Ripe fruit, back view.
7. The same seen from above.
8. A carpel opened, showing the seed.
9. Seed.
10. Section of the same.

(2–5, 8, 9 enlarged.)

D Blair ad nat. del. et lith.

M&N Hanhart imp.

CHONDRODENDRON TOMENTOSUM *Ruiz & Pav*

N. Ord. MENISPERMACEÆ. Lindl., Veg. K., p. 307; Baill., Hist. Pl., iii; Le Maout & Dec., p. 199.

Tribe *Pachygoneæ*.

Genus **Chondrodendron**, *Ruiz & Pavon*.* Miers, Contrib. to Bot., iii, p. 307; B. & H., Gen. i, pp. 38 (*Botryopsis*) & 963; Baill., l. c., p. 35. Miers describes eight species, all from tropical America, and some probably varieties of that described below.

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11. Chondrodendron tomentosum, *Ruiz & Pavon, Prod. Fl. Peruv., p.* 132 (1794).

Parreira brava (Old Portuguese). *Butua* or *Abutua* (Brazilian).

Syn.—Cissampelos Abutua, *Vellozo.* Cocculus ? platyphyllus, *A. de St. Hil.* Cocculus Chondodendron, *DC.* Botryopsis platyphylla, *Miers and others.*

Figures.—Vellozo, Fl. Fluminensis, x, t. 140 ?; St. Hilaire, Pl. Usuelles des Brésil., t. 42 (leaves only); Eichler, in Fl. Brasil., fasc. 38, t. 48; D. Hanbury, in Pharm. Journ., 1873, pp. 83, 102 (root and fruit).

Description.—A woody climber of considerable size, the stem reaching over 4 inches in diameter; bark rough, on the smaller branches closely covered with slightly elevated, elongated prominences. Leaves alternate, on very long petioles which are swollen at the ends, and inserted just within the margin of the blade; broadly ovate, with a more or less cordate base, and a blunt or pointed apex, entire, about 5 inches long (in our specimens—said to reach 12 inches), rather thick and coriaceous, smooth and green above, densely covered beneath with a fine, short, greyish tomentum, 5-nerved at the base, but the midrib much the most developed; veins prominent beneath. Flowers unisexual (dicœcious ?), very small, laxly arranged in elongated panicles springing from

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* Name from χόνδρος, a granule, and δένδρον, a tree, from the warty protuberances on the bark. Ruiz and Pavon (accidentally ?) spell the name *Chondodendron*, though giving this derivation. We have followed Miers in restoring what appears to be the correct spelling. The late D. Hanbury preferred to keep to that generally given (see Pharm. Journ., 1874, p. 421).

thick, axillary, leafless branchlets; pedicels shorter than the flowers; bracts minute. Male flowers:—Sepals 6, in two rows, obovate-spathulate, erect, smooth, fleshy, surrounded externally by three whorls of imbricating, ovate, ciliate, externally hairy bracts (also sepals ?), 3 in each whorl, the outer ones the smallest; petals 6, small, scale-like, ovate; stamens 6, opposite to and connected at the base with the petals, and about four times their length and two thirds the length of the sepals; filaments broad, connective wide, and prolonged beyond the anther-cells into an obtuse process turned towards the centre of the flower; no trace of pistil. Female flowers (not seen):—Floral envelopes as in the male; stamens either wanting or very small and rudimentary; carpels normally 6, erect, inserted on a short gynophore, smooth, 1-celled, with a single ovule laterally attached; style nearly absent. Fruit composed of 6 (or any less number by abortion), quite distinct, oblong-ovoid, smooth, purplish black drupes, nearly 1 inch long, attached by short stalks to the thickened woody gynophore, from which they spread in a radiating manner; pulp of the drupe scanty, putamen thin, coriaceous, ovoid, with a partition running upwards from the base half way to the top of the cavity. Seed strongly curved, and doubled over the partition, to which it is attached; testa thin, membranous; embryo consisting of two very large cotyledons and a minute radicle; no endosperm.

Habitat.—This plant grows in the neighbourhood of Rio de Janeiro, and in other parts of Brazil, also in Peru, climbing to the summit of high trees in the forests. The Portuguese name, "Parreira brava," signifies "wild vine," and was doubtless bestowed upon the plant from its habit, and the appearance of its bunches of fruit. When the large drupes become fully ripe, and those of different flowers are crowded together, the whole presents much the appearance of a bunch of grapes. Specimens are in cultivation at Kew, but have not yet flowered.

Miers, Contrib. to Bot., iii. p. 311; Eichler, in Mart. Fl. Bras., fasc. 38, p. 199; D. Hanbury, in Pharm. Journ., l. c., pp. 81 & 102.

Official Part and Name.—Pareiræ Radix; the dried root of Cissampelos Pareira, *Linn.* (B. P.). The dried root (*Pareiræ Radix*) (I. P.). Pareira. *Pareira Brava;* the root of Cissampelos Pareira (U. S. P.).

General Characters.—True Pareira Brava—that is, the one derived from *Chondrodendron tomentosum* (the official plant having been proved, by Hanbury, to produce a very different root)—is in long, branched or unbranched, more or less twisted or serpentine pieces, varying in thickness from ½ inch to 2 or more inches; and marked externally with deep, irregular, longitudinal furrows, and numerous transverse elevations and cracks. It is covered by a dark blackish-brown bark, within which the wood, which is of a light yellowish or dull greenish-brown colour, and loose fibrous texture, is arranged in evident concentric, or sometimes eccentric circles, divided into wedge-shaped portions by large medullary rays, and the zones of wood are also separated from one another by a crenated or wavy ring of waxy substance, which is of a pale colour at first, but becomes darker by keeping and exposure to the air. The root presents a coarse fibrous fracture, although when cut it appears of a waxy nature. It has no evident odour, but a well-marked bitter taste.

The stems are sometimes imported and sold as *Pareira Brava.* They may be distinguished by presenting a small, although evident pith, and by their lighter colour externally. In taste they resemble the root, and are probably but little inferior to it.

Substitutes.—The original Pareira Brava had almost disappeared from commerce, until Hanbury called particular attention to this drug in 1873; its place being supplied by spurious roots and stems, and commonly very inferior in medicinal properties to the true root. The principal of these have been described by Hanbury, under the names of White Pareira Brava, from *Abuta rufescens,* Aublet; Yellow Pareira Brava, from, it is presumed, *Abuta amara* of Aublet; and the Common False Pareira Brava, the botanical source of which is unknown, although evidently from a plant of the order Menispermaceæ. It is this spurious drug which has been the ordinary Pareira Brava of commerce for many years

past, and which was supposed to be derived from *Cissampelos Pareira*, L. It may be readily distinguished from the true drug by its lighter brown colour externally, and by cutting tough and fibrous like wood, and not with the close waxy character of the true root. The two drugs may be also readily distinguished by the action of iodine, for whereas a decoction of the spurious Pareira Brava is not coloured blue by iodine, that of the true drug is turned inky-bluish black by tincture of iodine.

Chemical Composition.—In the year 1838, Wiggers discovered in the Common False Pareira Brava, just described, a bitter principle, which he termed *Pelosine*. It is also known as *Cissampeline*. It was afterwards examined by Bödeker, and described as an uncrystallisable alkaloid, insoluble in hot or cold water, but soluble in alcohol and ether, and having a sweetish bitter taste. Subsequently, in 1869, Flückiger, in examining the stem and roots of the *Cissampelos Pareira*, L., obtained from Jamaica, as also the true Pareira Brava from *Chondrodendron tomentosum*, found the same bitter principle, and he pointed out that this body possessed the same chemical properties as the alkaloid *beberia* or *bebeerine* obtained from the bark of *Nectandra Rodiæi* of Schomburgh, and called Bebeeru or Greenheart bark; and also of *Buxine*, obtained by Walz from the bark of *Buxus sempervirens*, L. Flückiger found this bitter principle only in the very small proportion of ½ per cent. The properties of Pareira Brava are commonly said to depend on this alkaloid, but on this point we have no direct evidence. True Pareira Brava also contains starch, and hence its decoction is readily distinguished from that of the Common False Pareira Brava, by tincture of iodine, as already noticed, under the head of Substitutes for Pareira Brava.

Medical Properties and Uses.—Pareira Brava is commonly regarded as a mild tonic and diuretic, exercising apparently an almost specific influence over the mucous membrane of the genito-urinary organs. Sir B. Brodie states that in chronic inflammation of the bladder it is a most valuable medicine, very materially lessening the secretion of the ropy mucus of this disease, and diminishing

also the inflammation and irritability of the bladder. It may be combined with nitric acid or an alkali, according to the state of the urine, and some tincture of henbane may be also added. It has likewise been regarded as a very useful remedy in cystirrhœa, catarrhal affections of the bladder, and chronic pyelitis. Great difference of opinion, however, exists among practitioners as to the value of Pareira Brava, much of which is probably due to the varying character of the drug, but now that the genuine root may be obtained, it is hoped that its merits will be properly tested. It was at one time regarded as a valuable lithontriptic. In Brazil it is employed in the cure of the bites of venomous serpents.

Pharmacographia, p. 25; Per. Mat. Med., vol. ii, pt. 2, p. 672; U. S. Disp., by W. & B., p. 660; Prout, On Stomach and Renal Diseases, p. 392; Flückiger, in Pharm. Journ., vol. xi, 2 ser., p. 192; Brodie, Diseases of the Urinary Organs, 3rd ed., p. 109; Wiggers, Ann. Ch. Pharm., xxviii, p. 29; Hanbury, in Pharm. Journ., vol. iv, 3rd ser., pp. 81 and 102.

DESCRIPTION OF PLATE.

The flowering branch from a specimen in the British Museum, collected in Peru by Pavon; the fruit from a specimen in the Museum of the Pharmaceutical Society, collected near Rio by Mr. Peckolt; the root from a specimen in the Sloane Collection in the British Museum.

1. A flowering male branch.
2. Section of male flower.
3. Portion of a bunch of fruit.
4. Diagram of a fruit with its six drupes developed.
5. A single drupe.
6. Vertical section of the same.
7. Under surface of a leaf.
8. Section of root.

(2 magnified.)

D Blair ad nicc del. et lith.

M&N Hanhart imp

TINOSPORA CORDIFOLIA, *Miers*

N. Ord. MENISPERMACEÆ.

Tribe *Heteroclinieæ*.

Genus Tinospora,* *Miers*. B. & H., Gen., i, p. 34; Miers, l. c., p. 29; Baill., iii, p. 13. Species 11, natives of Asia, Africa, and Australia, in the tropics.

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12. Tinospora cordifolia, *Miers in Ann. Nat. Hist., ser.* 2, vii, *p.* 38 (1851).

Gulancha (Hindustani).

Syn.—Menispermum cordifolium, *Willd.* Cocculus cordifolius, *and* C. convolvulaceus, *DC.*

Figures.—Rheede, Hort. Malab., vii, t. 21; Wight, Ic. Plant. Ind., ii, tt. 485, 486; Miers, Contrib. Bot., iii, t. 91.

Description.—A woody climber, with perennial stems reaching 2 inches in diameter, with a thick, soft, warted bark, the younger branches succulent with the bark smooth, giving out adventitious roots sometimes many yards in length and excessively slender, which lengthen downwards and at last reach the soil. Leaves alternate, on long flexuose petioles, spreading, 2—4 inches long, roundish-ovate, entire, cordate at the base, acute at the apex, quite smooth, thin, somewhat glaucous beneath. Flowers diœcious, pedicellate, inconspicuous, yellow, in short, axillary, long-stalked racemes, the male in small fascicles, the female solitary, bracts minute. Male flowers:—Sepals 6 in two rows of 3 each, the outer short, roundish, the inner twice as long, broadly obovate, concave, smooth; petals 6, opposite the sepals, and about half the length of the inner ones, clawed below, somewhat 3-lobed above, with the lateral lobes involute; stamens 6, longer than the petals, immediately in front of which they stand and by which they are partially enwrapped, filaments much thickened at the end, anther-cells oblong, widely separated below; no rudiment of carpels. Female flowers:—Sepals as in the male; petals oblong-spathulate;

* Name from τείνω, to spread or extend, and σπορά, seed; from the extreme divarication of the cotyledons and the further extension of the endosperm curving round the hollow process of the putamen.

stamens reduced to small oblong scales in front of the petals; carpels 3, distinct, opposite the outer sepals, elevated on a thick gynophore, ovary oblong-ovoid, smooth, style short, thick, stigma dilated, tongue-shaped, laciniate. Fruit of 3 (or more usually less by abortion) shortly stalked, subglobose drupes, with an apiculus on one side marking the position of the style, about as large as a pea, red, pulp scanty, putamen thin, bony, convex outside, with a deep, large, hollow process extending to the middle of the fruit on the ventral surface, making the cavity horse-shoe-shaped. Seed similar in form to the cavity which it fills, embryo enclosed in the copious endosperm which is ruminated on the hollow, ventral surface, radicle rounded, superior, cotyledons leafy, ovate, veined, very divaricate.

Habitat.—This species is found throughout the Indian Peninsula and extends into Ceylon, Burmah, and Assam. It is said to climb over the highest trees, and to throw out aerial roots which reach the length of 30 feet, though not thicker than pack-thread.

Miers, Contrib. Bot., iii, p. 31; Fl. Brit. Ind., i, p. 97.

Official Parts and Names.—Tinosporæ Radix et Caules; the root and stems, collected during the hot season, when the bitter principle is most abundant and concentrated (I. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of the United States.

General Characters and Composition.—As met with in the bazaars of India, where it is known under its Hindustani name of *Gulancha*, it consists of the dried transverse slices of the cylindrical woody stems. These pieces vary in length from about ½ an inch to 2 inches, and in diameter from ¼ of an inch to 2 inches, averaging about ½ an inch. They present a more or less shrunken appearance, especially those that have been obtained from the younger stems; and are covered with a smooth, translucent, shrivelled bark, which becomes rough, and of a dull appearance with age. In many cases the pieces are marked externally with warty protuberances, and the scars of adventitious roots. The surfaces of the pieces exhibit a radiated appearance, being marked

by large medullary rays separating the woody portion into a corresponding number of wedge-shaped bundles, which have a very porous structure, but no concentric layers. Gulancha has no odour, but a very bitter taste. In the Bengal Dispensatory, the root is described by O'Shaughnessy, to be of large size, and soft and spongy.

Nothing satisfactory is known of the chemical composition of Gulancha. Its infusion is not blackened by a persalt of iron. The bitter principle to which it owes its properties does not appear to have been examined.

Medical Properties and Uses.—Gulancha is reputed to possess tonic, antiperiodic, and diuretic properties. Its uses were more especially made known by Dewan Ramcomul Sen, in 1827, and its properties have been subsequently testified to by O'Shaughnessy, Waring, and many other Indian practitioners. Waring says, Gulancha renders "the Indian practitioner in a great measure independent of foreign medicines of the same class. It is a remedy highly esteemed by the Hindoos, and one which might be advantageously admitted into European practice, being abundant, cheap, and efficacious as a general tonic. The extract, called by the Hindoos *Palo*, is considered to be possessed of great power." It is of more value as a bitter tonic than as an antiperiodic.

Gulancha is regarded as especially valuable in general debility after fevers and other exhausting diseases. It is also reputed to be a useful remedy in secondary syphilitic affections, chronic rheumatism, and mild forms of intermittents. Speaking of its employment as an antiperiodic, Waring states, that he employed it in twenty cases of ordinary quotidian fevers, in Burmah; and in each case it prevented the accession of the cold stage, but it did not appear to diminish the severity, or prevent the regular return of the hot stage, a peculiarity, he adds, not observed by him in the use of any other remedy of the same class.

Gulancha is also regarded by the natives in certain parts of India, as a specific for the bites of poisonous insects and venomous snakes.

Waring's Man. Pract. Therap., p. 245; Bengal Dispensatory,

p. 198; Pharm. of India, pp. 9 and 435; Pharmacographia, p. 32; Trans. of Med. and Phys. Soc. of Calcutta, vol. iii, p. 294, vol. iv, p. 431, and vol. vii, p. 15.

DESCRIPTION OF PLATE.

Drawn from specimens in the British Museum, collected in India by Roxburgh and Wight.

1. Branch of a female plant with flowers.
2. A female flower.
3. Outer sepal.
4. Inner sepal.
5. Petals and abortive stamens.
6. Carpels and gynophore.
7, 8. Fruit.
9. Vertical, and—10. Transverse section of the same.
11. Embryo.
12. A male flower (stamens and petals should be opposite the sepals, not alternate).
13. Outer sepal.
14. Inner sepal, petal and stamen.

(2–6, 8–14 enlarged.)

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D.Blair, ad nat. et sicc. lith

M&N.Hanhart imp

JATEORRHIZA CALUMBA, *Miers*

N. Ord. MENISPERMACEÆ.

Tribe *Heteroclinieæ*.

Genus **Jateorhiza**,* *Miers*. B. & H., Gen., i, p. 34; Baill., Hist. Pl., iii, p. 37 (*Chasmanthera*); Miers, Contrib., iii, p. 26. Species 2 or 3, natives of tropical Africa.

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13. Jateorhiza Calumba,† *Miers, in Hook. Fl. Nigrit., p.* 214, *note* (1849).

Calumba. Columbo.

Syn.—Menispermum palmatum, *Lam.* Menispermum Columba, *Roxb.* Cocculus palmatus, *DC.* Jateorhiza palmata, *Miers.* Jateorhiza Miersii, *Oliver.* Chasmanthera Columba, *Baill.*

Figures.—Berry, in Asiatic Researches, x, t. 5, cop. in Hayne, ix, t. 48, and in Nees, t. 364; Bot. Mag., t. 2970, 2971, cop. in Steph. & Ch., t. 160 (*J. palmata*), and in Woodv., v, 5; Miers, Contrib., iii, t. 90; Baill., l. c., figs. 16, 17.

Description.—A perennial herb, with a short, rounded, irregular rhizome, giving off numerous fleshy, swollen, fusiform, cylindrical roots 1—4 inches in diameter, tapering into fibres below, covered with a thin, dull-brown, nearly smooth skin, the surface of the flesh bright yellow, paler yellow within. Stems several, herbaceous, not more than ½ inch thick, twining and climbing widely, and reaching the summits of trees, slightly branched, green, rather thickly covered with stiff, spreading, gland-tipped hairs. Leaves alternate, at long intervals, on very long petioles, large, the blade reaching 14 inches wide by 10 inches long in large specimens, nearly orbicular, strongly cordate at the base, palmately lobed, the lower with 7—5 acute, entire lobes, the upper 3-lobed, dark green and slightly rough above, paler with prominent veins below, which as well as the margins are strongly hispid, thin and semi-membranaceous. Flowers dicœcious, about

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* Name from *ἰατήριος*, healing, and *ῥίζα*, a root, from its medicinal virtues.

† The name is here spelt *Columba*, as also by Roxburgh; but in his subsequent papers Miers spells it as above. It is derived from the native African name for the root, *Kalumb*.

½ inch diameter, nearly sessile, arranged on the divaricate branches of large, drooping, axillary, lax panicles, the male panicles 12—18 inches long, the female much shorter, rachis and branches setose-hispid, or nearly glabrous, bracts minute or none. Male flowers: sepals 6 in two rows, erect, strongly imbricate, oval-oblong, blunt, smooth; petals 6 in a single row, much shorter than the sepals, oval, pale green, blunt, incurved, so as to include the stamens; stamens 6, as long as the petals, and opposite to them, filaments slender, thickened upwards, and turned outwards at the top, anthers 4-celled, extrorse; carpels quite rudimentary or none. Female flowers (not seen): petals emarginate at the apex; stamens 6, sterile, half the length of the petals; carpels 3, free, erect, oblong, densely glandular-pilose, ovary 1-celled, with one ovule attached to centre of the inner angle, styles short, thick, stigmas with 2 or 3 spreading points. Fruit of 3 (or less by abortion) ovoid, fleshy drupes about the size of a hazel-nut, with a rather scanty pulp, putamen thin, densely covered with longish hairs, which are immersed in the pulp, rounded on the back, flattened on the inner side. Seed solitary, filling the fruit, curved both laterally and from above downwards, embryo buried in the abundant fleshy endosperm, which is transversely fissured on the inner side, cotyledons foliaceous, flattened, divaricate, radicle small, terete.

Habitat.—A native of forests in the Mozambique and Quilimane countries of Eastern tropical Africa, especially abundant along the course of the Lower Zambesi. It is also met with cultivated on the little islets of Ibo and Mozambique off the same coast. All the Calumba root of commerce comes from these Portuguese possessions. The plant has at various times been cultivated at Calcutta, in the Mauritius, the Seychelles, and Madagascar, and specimens may be seen in a flowerless state at Kew and the Botanic Society's Gardens.

The amount of hispidity is liable to great variation, and the leaves present a considerable range in size and difference in the form of the basal lobes. We have therefore followed Hanbury in combining *J. Calumba* and *J. palmata*, Miers (*J. Miersii*, Oliv.),

but have preferred to keep the former specific name to the latter; the two being of the same date.

Oliver, Fl. Trop. Africa, i, p. 42; Miers, Contrib. Bot., iii, p. 27; Roxb., Fl. Indica, iii, p. 807; Hook., in Bot. Mag., t. 2970-1; Lindl., Fl. Med., p. 369; Flück. & Hanb., Pharmacog, p. 22.

Official Part and Names.—Calumbæ Radix; the root, cut transversely and dried, of Jateorhiza Calumba, *Miers*, and J. Miersii, *Oliver* (B. P.). The root (*Calumbæ Radix*) of the above plants (I. P.). Calumba; the root of Jateorhiza palmata, *Miers* (Cocculus palmatus, *De Candolle*); and of Jateorhiza Calumba, *Miers* (Cocculus palmatus, *Wallich, Catal. non DC.*) (U. S. P.).

Collection, Preparation, and Commerce.—We have no recent information in reference to the collection and preparation of this drug for the market, the only notice on these points we possess being derived from Dr. Berry's 'Asiatic Researches,' dated as far back as 1808. From these it appears that the roots are dug up from wild plants in the hot and dry season (March), the fleshy tubercules are then separated from the short main root, and cut transversely into slices; these are dried in the shade, and constitute the *Calumba root, Calumba,* or *Columbo* of commerce. Calumba root is either shipped directly to Europe and the United States from Zanzibar, or it is obtained indirectly from Bombay and other Indian ports. It was formerly supposed from its name to be derived from Colombo, the capital of Ceylon; but, as already noticed, the English name is derived from *Kalumb,* the native African name for the root.

General Characters and Composition.—Calumba root or Columbo, as commonly met with in commerce, consists of irregular, flattish, circular or somewhat oval pieces, from one to two or more inches in diameter, and from $\frac{1}{8}$ to $\frac{1}{2}$ an inch or more in thickness. Cylindrical pieces from one to two inches long are also occasionally met with. The cortical part, which is separated from the central woody portion by a fine dark-coloured line, is thick, somewhat corky in texture, yellowish or dull greenish-yellow in colour, and is covered by a brownish-yellow, wrinkled, outer coat. The central or woody portion is of a greyish-yellow colour, more or less concave

on its two surfaces from contracting in the drying process in consequence of its spongy nature, and marked by evident radiating lines and faint concentric circles. Calumba root has a feeble musty odour; and a very bitter taste, more especially the cortical portion. It is very brittle, breaking with a mealy fracture, and is readily reduced to powder. The pieces are often perforated with small holes, which are caused by insects devouring the starch which it contains.

The principal constituents of Calumba root are *calumbin*, *berberia*, *calumbic acid*, and *starch*. It is entirely free from both tannic and gallic acid. The bitter taste and medicinal properties are due to the three first-named constituents. Starch constitutes, on an average, nearly one third of its weight; and hence a decoction of calumba root when cold is blackened by a solution of iodine. Calumbin or Calumba-Bitter, its principal constituent, is a neutral, peculiar, crystalline, colourless, bitter principle. Berberia is a bitter crystalline alkaloid of a yellow colour, which was first discovered in the common barberry (*Berberis vulgaris*); and which appears to exist in calumba root in combination with calumbic acid; the latter, when separated, is in the form of a yellowish amorphous powder. The yellow colour of calumba is due to berberia, or to this alkaloid in combination with calumbic acid. The best solvent of the active principles is alcohol; these principles are but very slightly soluble in water.

Adulterations and Substitutions.—According to our experience, calumba root is rarely or ever adulterated at the present time in this country, and it is, moreover, rare to find any other root or stem substituted for it. The only substitution that we have seen is, the substance that Hanbury described some years since, and which he proved to be the transverse slices of the stems of *Coscinium fenestratum*, a Menispermaceous plant, like that yielding the true calumba root, but obtained from Ceylon, and not Eastern Africa like it. The slices thus offered as calumba root are readily distinguished by their greater smoothness and hardness, and from not being contracted in their central portion. Of late years, these slices have been offered in the market in somewhat large

quantities, as the produce of the stems of the true calumba plant, but, as just noticed, their botanical and geographical sources are different. The sliced roots of White Bryony (*Bryonia dioica*), and of American or False Calumba (*Frasera Walteri*), have been also said to have been used as adulterants of, or substitutions for, true calumba root, but the structure of these two roots is so strikingly different from that of the genuine drug, that no one acquainted with its characters could be deceived. American Columbo is official in the Secondary List of the United States Pharmacopœia.

Medical Properties and Uses.—Calumba root is a bitter stomachic and mild tonic. Its especial value as a tonic resides in the fact of its not producing nausea, sickness, febrile disorder, or headache, like other remedies of the class to which it belongs. It has been found of great value in general debility, gastric irritability, to allay the vomiting frequently attendant on pregnancy, in atonic dyspepsia, and in the advanced stage of diarrhœa and dysentery when the inflammatory symptoms have subsided. As it contains neither tannic nor gallic acid, it undergoes no change when combined with salts of iron and alkalies, and it may therefore be frequently advantageously prescribed in conjunction with them.

Per. Mat. Med., by B. & R., p. 983; Pharmacographia, p. 23; U. S. Disp., by W. & B., p. 199; Garr., Mat. Med., p. 186; Pharm. Centr. Blatt. für 1830, S. 517, and 1831, S. 429; Amer. Journ. Pharm., vol. xx, p. 322; Chem. Gaz., vol. vii, p. 150; Pharm. Journ., 1st ser., vol. x, p. 321, and vol. xii, p. 185.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum cultivated in the Botanic Garden, Calcutta (Wallich, no. 4953A); the root added from a plant cultivated in Kew Gardens; the fruit copied from Miers. 1. Portion of stem of a male plant with leaves and flowers. 2. A male flower. 3. Vertical section of the same. 4. A petal with included stamen. 5 and 6. Stamens. 7. A ripe drupe. 8. The same with half the pulp removed. 9. The putamen with the woolly coat half removed. 10. A seed. 11. Vertical, and—12. Transverse section of the same. 13. Rhizome and roots. 14. Transverse section of a root. (2–6 enlarged.)

ANAMIRTA PANICULATA *Colebr.*

M & N Hanhart

N. Ord. MENISPERMACEÆ.

Tribe *Heteroclinieæ*.

Genus Anamirta,* *Colebrooke*. B. & H. Gen., i, p. 35; Baill., Hist. Pl., iii, p. 40; Miers, Contrib., iii, p. 49. Species 7 (Miers), natives of India and the Malayan Islands.

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14. Anamirta paniculata, *Colebrooke, in Trans. Linn. Soc. Lond.*, xiii, *p.* 66 (1822).

"*Cocculus*† *indicus.*"

Syn.—Menispermum Cocculus, *Linn.* (in part). M. heteroclitum, *Roxb.*; Anamirta Cocculus, *Wight & Arn.* Cocculus suberosus, *DC.*

Figures.—Nees, tt. 365, 366; Berg & Sch., t. 14 a (fruit); Rheede, Hort. Malab., vii, t. 1; Ann. des Sc. Naturelles, ser. 2, ii, t. 3; Miers, l. c., t. 97 (fruit).

Description.—A large woody twiner, with thick branches; bark deeply corrugated, corky, grey. Leaves alternate, on long stalks, which are thickened at both ends and prehensile, blade subcoriaceous, varying from 4 to 8 inches long, ovate or cordate-ovate, acute, smooth and pale green above, whitish below with tufts of hair in the axils of the prominent veins, margin nearly entire. Flowers small, dicœcious, arranged in pendulous compound racemes 8 to 12 or more inches long, springing from the old wood, on short, thick, divaricated pedicles, rachis smooth. Male flowers: sepals 6 imbricate, surrounded at the base with 2 or 3 small bracts, ovate, thin, spreading; petals none; stamens numerous, closely crowded on a shortly stalked globose receptacle, so as to form a round mass in the centre of the flower, filaments almost absent, anthers 4-celled. Female flowers: sepals as in the male; petals none; stamens represented by a hypogynous ring of 10 very small bifid fleshy staminodes united below; carpels 5, rarely 4 (or 3?), supported on a short gynophore, which divides

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* *Anamirta*, taken "from an Indian term contrasting it with a name of a common *Menispermum*."

† *Cocculus*, the mediæval name for these fruits; from the Italian *coccola*, a small berry.

above into short thick branches, erect, flask-shaped, gibbous below, smooth, 1-celled; stigmas terminal, triangular, reflexed. Fruit of 1–5, usually 2, rounded-ovoid drupes about ½ inch long, with the remains of the stigma on the inner side, each obliquely supported on a short strong branch springing from the summit of the gynophore, which has become a hard woody stalk ¼ inch long; pulp very scanty, endocarp thin, brittle, indehiscent, penetrating deeply on the ventral side, so as to form a hollow space in the fruit, and reflexed so as to divide this into two cavities. Seed reniform on section from the intrusion of the endocarp, embryo large, curved, with two narrowly lanceolate widely separated cotyledons lying in the centre of abundant endosperm.

Habitat.—This climbing shrub grows commonly on the eastern side of the Indian Peninsula; also in Ceylon and some of the Malayan Islands, unless the plants from these parts are to be referred, as is done by Mr. Miers, to different species. There are specimens in the gardens at Kew, Chelsea, and the Regent's Park, but they have not flowered.

Miers, Contrib. Bot., iii, p. 51; Hook. f., Fl. Brit. Ind., i, p. 185; Lindl., Fl. Med., p. 371.

Official Part and Name.—Cocculus Indicus; the fruit dried of Anamirta Cocculus, *W. et. A.* (I. P.). Not official in either the British Pharmacopœia, or the Pharmacopœia of the United States.

Commerce.—Cocculus Indicus is imported from Bombay and Madras. It was formerly brought to Europe by way of the Levant, and hence the names of *Levant nut* and *Levant shell,* by which it used to be designated. The amount consumed in this country is not accurately known, but the average imports annually are probably not less than 50,000 lbs.

General Characters and Composition.—As met with in commerce, the dried fruit, which is commonly known as *Cocculus Indicus,* is somewhat kidney-shaped, and generally less than ½ an inch in length, or about the size of a small hazel nut. It is covered externally by a thin, blackish-brown, wrinkled skin,

which covers a whitish, thin, woody shell or endocarp. On one side of the fruit this shell doubles inwards, and forms a projection, which is contracted at the base, but enlarged and divided above into two branches; and upon this projection there is placed a solitary, oily, yellowish-white seed, of a reniform or somewhat semilunar shape. In a vertical section of the fruit this seed is seen not to fill the shell, as it contracts in drying, and by keeping it becomes more and more shrivelled and wasted, so that in old samples of cocculus indicus the shell is frequently found almost empty. The test of the goodness of cocculus indicus formerly given in the Edinburgh Pharmacopœia, was, that "the kernels should fill at least two thirds of the fruit." Cocculus indicus has no odour, and the shell is almost tasteless, but the seed is very bitter.

Cocculus indicus has been sometimes confounded with the fruit of *Laurus nobilis*, which is commonly known as the Bay berry. The latter is, however, generally larger, distinctly oval in form, and its contained seed lies loose in, and fills the cavity of, the fruit. The seed of the bay berry has also an agreeable aromatic odour, a firm consistence, and is readily separated into two equal portions.

The pericarp of cocculus indicus contains two isomeric, tasteless, crystallisable alkaloids, termed *menispermia* and *paramenispermia*, combined with an acid called *hypopicrotoxic acid*. Of these substances but little is known. The properties of cocculus indicus are entirely due to the presence of a white, crystalline, non-nitrogenised, intensely bitter, very poisonous, neutral principle, termed *picrotoxin*, which is only contained in the seed. Picrotoxin is soluble in water and in alkaline solutions. An aqueous solution is not affected by tannic acid, or by any metallic salt, hence picrotoxin may be readily distinguished from the bitter poisonous alkaloids.

Medical Properties and Uses.—Both cocculus indicus and picrotoxin are poisonous. They are never administered internally, but are occasionally employed externally in the form of an ointment (made by incorporating about eighty grains of the seeds, or ten

grains of picrotoxin, with one ounce of prepared lard), as an insecticide, to destroy pediculi, &c., and in some obstinate forms of chronic skin disease. Its use, however, requires great caution, and more especially so when the skin is abraded.

Cocculus indicus and picrotoxin act as intoxicating agents, and hence the former is used for taking fish, which it stupefies, and for adulterating beer and ale. For the latter purpose especially it is said to be largely employed by publicans, to impart a bitter taste to the malt liquors and to increase their intoxicating effects, but it must be admitted that we have no very satisfactory evidence on this point, for but very few cases are on record in which cocculus indicus has been detected by chemists in malt liquors; although recently a correspondent in the 'Pharmaceutical Journal' has found cocculus indicus in some port wine lees.

Per. Mat. Med., vol. ii, pt. 2, p. 667; Pharmacographia, p. 30; U. S. Disp., by W. & B., p. 1573; Gerarde's Herbal, by Johnson, 1636, p. 1549; Bentley, Man. Bot., p. 411; Pharm. Journ., vol. xv, 1st ser., p. 407, and vol. vi, 3rd ser., p. 540.

DESCRIPTION OF PLATE.

The male flowers and foliage drawn from a specimen in the British Museum from the Calcutta Botanic Garden (Wallich); the female flowers and fruit from specimens in the same herbarium, collected by Thwaites in Ceylon (no. 2722 = *A. toxifera*, Miers).

1. Leaves.
2. Panicle of female inflorescence.
3. A female flower.
4. The same, with the sepals removed.
5. The same, with the carpels also removed to show the ring of abortive stamens and gynophore.
6. A male flower.
7. Section of an anther.
8. Fruit.
9. A single drupe, ventral surface.
10. Vertical, and—11. Transverse section of the same.

(3–7 enlarged.)

D.Blair ad nat del et lith.

M & N.Hanhart imp

CISSAMPELOS PAREIRA, *Linn*

N. Ord. MENISPERMACEÆ.

Tribe *Leptogoneæ.*

Genus Cissampelos,* *Linn.* B. & H., Gen. i, p. 37; Baill., iii, p. 41; Miers, l. c., p. 127. Species variously estimated at 18 or 70, found in the tropics and warm regions of both hemispheres.

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15. Cissampelos Pareira,† *Linn., Sp. Pl., ed.* 1, *p.* 1031 (1753).

Velvet Leaf.

Syn.—C. microcarpa, *DC.* C. clematidea, *Presl.*

Figures.—Woodville, t. 65; Nees, t. 367; Baill., l. c., figs. 22–28; Descourtilz, Fl. Antilles, iii, t. 201.

Description.—A woody climber or twiner with slender terete stems of light open structure, and rarely reaching an inch in diameter, covered with a light brown wrinkled bark, and with thickened nodes at long intervals; the young green shoots elongated, slender, and whiplike, densely downy at the ends. Leaves alternate, on longish slender petioles inserted more or less within the margin of the blade, 1—2 inches long, nearly orbicular, with an acute apex and faintly cordate base, entire, palmately veined, smooth above, silky beneath or when young on both sides, bright full green. Flowers dicœcious, very small; the male in branched, solitary or fasciculate, rather dense panicles, with filiform divaricate dichotomous branches; the female stalked, in fascicles of 5 or 6 in the axils of roundish, leafy, readily deciduous bracts, laxly arranged on a slender axillary branch. Male flowers:—Sepals 4, spathulate-ovate, with long hairs outside, entire, spreading; petals combined into a cup-shaped 4-lobed corolla; stamen solitary (?), central, filament short, capitate at the summit, bearing 4 anther-cells on its margin. Female

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* Named from κισσός, ivy, and ἄμπελος, a vine; from the appearance. The κισσάμπελος of Dioscorides was, of course, not this plant.

† *Pareira*, so named by Linnæus under the idea that this yielded the *pareira brava* of commerce.

flowers :—Sepal solitary, oval, hairy outside; petal solitary opposite the sepal, and like it in form and size or smaller, greenish-white; pistil of one carpel, ovoid, gibbous on the side opposite the petal, densely silky, style short, stigmas 3, pointed, spreading, ovary one-celled, with a single suspended ovule. Fruit a single small, ovoid drupe, with the remains of the style near the base, epicarp slightly fleshy, thin, pilose, endocarp (putamen) compressed, transversely ridged and furrowed on the edge, hollowed on the sides, cavity horse-shoe-shaped from the doubling-in of a process of the endocarp. Seed strongly curved, filling the cavity; testa very thin, attached to the process; embryo slender, terete, much curved in the axis of the endosperm; cotyledons linear, incumbent.

Habitat.—If we restrict this species as does Mr. Miers it is found in the West Indian Islands and Central America only; if we follow the authors of the 'Genera Plantarum' it is very widely diffused over all the tropical regions of both hemispheres. There is no occasion here to go into questions of the definition of species, on different views of which this variance depends. The plant of the West Indies, which appears to be very common in most of the islands, and has been long familiar, is certainly the form upon which Linnæus founded the species. The plant was introduced about 1780, and at Kew flowers in July and August.

Lunan, Hort. Jamaic., ii, p. 254; Descourtilz, Fl. Ant., iii, p. 231; Grisebach, Fl. Brit. W. Indies, p. 10; Miers, l. c., p. 139; Fl. Brit. India, i, p. 104; Brandis, Forest Fl. India, p. 10; Flück. & Hanb., Pharmacogr., p. 28; Lindl., Fl. Med., p. 372.

Official Part and Name.—Pareiræ Radix; the dried root of Cissampelos Pareira, *Linn.* (B. P.). The dried root (*Pareiræ Radix*) (I. P.). Pareira, *Pareira Brava;* the root of Cissampelos Pareira (U. S. P.).

Source of Pareira Brava.—We have already stated under the head of *Chondrodendron tomentosum* that this plant and not the official plant now under notice is the source of the true Pareira Brava, that is, of the root which was originally used under that name, and

upon which its reputation as a medicine was founded. We also stated in the same place that the official *Cissampelos Pareira* was not even the source of the spurious root which had been the ordinary Pareira Brava of commerce for many years past, as the characters of its root were very different, as proved by Hanbury, both from it and from the true Pareira Brava. The characters of the drug derived from the official plant are now given.

General Characters and Composition.—A sample of this spurious Pareira Brava, as obtained from Jamaica by Hanbury, is in the form of long cylindrical stems, some of them terminating in roots, and others emitting roots here and there. These stems closely resemble the climbing stems of the common *Clematis Vitalba* of this country. They vary in diameter from about a quarter of an inch to an inch, averaging about half an inch. Externally they are covered by a light brown bark, which presents shallow longitudinal furrows more or less spirally arranged, and transverse knots placed at intervals of from one to three feet. The roots are somewhat darker in colour. A transverse section of the stem or root exhibits a pale greyish-brown wood, which is traversed by narrow medullary rays, which separate it into from 10 to 20 very porous converging wedges; but the large concentric zones as seen in the true pareira brava and the ordinary spurious drug are here absent. The wood is surrounded by a dark greyish-brown corky bark. Both root and stem are without odour; but they have a pure bitter taste, without any aromatic, sweetish, or astringent character.

We have already noticed under *Chondrodendron tomentosum* that the drug now under consideration contains the same bitter principle as that of the true Pareira Brava and of the common False Pareira Brava, namely, *Cissampeline* or *Pelosine*, and which Dr. Flückiger believes to be identical with *Beberia* or *Bebeerine* and also with *Buxine*.

Medical Properties and Uses.—The medical properties and uses of Pareira Brava are given under *Chondrodendron tomentosum*; but the drug now under notice, although used as a medicine in

the West Indies, does not appear to have ever been exported to Europe.

Pharmacographia, p. 26; Per. Mat. Med., by B. and R., p. 990; Flückiger in Pharm. Journ., vol. xi, 2nd ser., p. 192; Wiggers, Ann. Ch. Pharm., vol. xxviii, p. 29; Hanbury, in Pharm. Journ., vol. iv, 3rd ser., pp. 81 and 102; Amer. Journ. Pharm., Oct. 1, 1873.

DESCRIPTION OF PLATE.

The flowering plant drawn from a specimen in the Royal Gardens, Kew; the fruit and stem from specimens from Jamaica in the British Museum; the male flowers added from Baillon.

1. Young branch of a female plant with flowers.
2. A fascicle of female flowers.
3. A flower.
4. A sepal.
5. A petal.
6. A fruit.
7. The endocarp.
8. Section of fruit.
9. A male flower.
10. Section of same.
11. Portion of full-grown stem.
12. Transverse section of same.

(2, 7, 8 enlarged; 3, 4, 5, 9, 10 much magnified.)

DBlair FLS ad sicc del. et lith.

M&N Hanhart imp.

BERBERIS ARISTATA, *DC*

N. Ord. Berberideæ. Lindl., Veg. Kingd., p. 437; Le Maout and Dec., p. 202; Baill., Hist. Pl., vol. iii.

Tribe *Berbereæ*.

Genus Berberis,* *Linn.* B. & H., Gen., i, p. 43; Baill., l. c., p. 73. Species (including *Mahonia*) about 60 or 70, natives chiefly of S. America and Asia.

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16. Berberis aristata, *DC., Syst. Veget.*, ii, *p.* 8 (1821).

Sūmlu (Punjab).

Syn.—Berberis tinctoria, *Leschen.* B. chitria, *Ham.*

Figures.—Delessert, Ic. Select., ii, t. 2; Wight, Ill. Ind. Bot., t. 8; Bot. Mag., t. 2529; Hooker, Exotic Flora, t. 98; Royle, Ill. Bot. Himalaya, t. 64.

Description.—A shrub reaching 8 feet in height, with a thick woody root covered with a thin brittle bark; branches erect, cylindrical, smooth, slender, strongly striate, with a pale yellowish-grey bark. Leaves of the elongated barren shoots converted into spreading, cylindrical, straight, tapering, very sharp, hard, smooth spines, with a broad, semi-amplexicaul base and usually two lateral smaller spinous branches (stipules) spreading at right angles; secondary leaves closely placed on very short branches from the axils of the spines, forming dense fascicles, usually persistent and evergreen, 1—2½ inches long, narrowly obovate-oblong, sessile, tapering to the base, acute, entire or with a few distant adpressed bristles forming very shallow teeth in the upper part, leathery, smooth, dark green, paler beneath. Flowers numerous, stalked, arranged in usually drooping racemes pendulous from the leaf-fascicles and about 3 inches long, bracts small, linear, acuminate. Sepals 8 or 9, imbricate, oval, blunt, petaloid, veined, yellow, the outer much the smallest. Petals 6, in two rows, strongly imbricated, scarcely spreading, slightly longer than the inner sepals, oval or obovate-oval, concave, somewhat hooded at the end, bright yellow, veined, with two oval-linear glands at the base of the lateral veins. Stamens 6 equal, hypogynous, opposite

* *Berberis*, a mediæval name, probably of Arabic origin.

and slightly shorter than the petals to the base of which they are sometimes slightly adherent, anthers innate, blunt, 2-celled, the cells opening by an oval valve. Ovary simple, oval-oblong, tapering, 1-celled, with a few erect ovules, style short, stigma peltate, flat. Fruit a small berry about ¾ inch long, ovoid or oblong-ovoid, smooth, purple with a whitish "bloom," tipped with the persistent style and stigma. Seeds 2—4, erect, ovoid, somewhat flattened, testa thin, smooth, leathery, embryo large, with flat oval cotyledons, in the axis of the copious soft endosperm.

Habitat.—A native of the whole range of the Himalaya mountains at an elevation of 6000 to 10,000 feet, also occurring in the Nilgiri range in Southern India and in the mountains of Ceylon. It flowers in April and May, and is a hardy plant in English gardens.

B. aristata is a near ally of the common European Barberry native to this country, from which it differs chiefly in its more coriaceous nearly evergreen leaves, more numerous flowers and longer style, besides the greater difference of the fruit. It is very variable in the size and form of the leaves, and several species have been described which are now considered mere forms, being arranged by J. D. Hooker under three leading varieties. Two other nearly allied species are also sources of Indian Barberry bark; *B. Lycium,** Royle, a native of the Western Himalayas, which is figured in Royle's 'Illustrations of Himalayan Botany,' t. 64, and *B. asiatica*, Roxb., found in the same mountain range and also in Afghanistan, of which a figure is given in Delessert's 'Icones Selectæ,' II, t. 1.

Hook. f. & Thoms., Fl. Ind., i, p. 222; Fl. Brit. Ind., i, p. 110; Brandis, Forest Flora, p. 12; Royle, in Trans. Linn. Soc., xvii, p. 83; Flück. & Hanb., Pharmacogr., p. 33.

Official Part and Name.—Berberidis Cortex; the root-bark of Berberis asiatica, *DC.*, Berberis aristata, *DC.*, and Berberis Lycium, *Royle* (I. P.).

* So called from the λύκιον, a celebrated drug of ancient Greece, which has been shown by Royle to have been prepared from the root of this and other species of *Berberis*, and to be identical with a substance still made in India.

Indian Barberry Bark is not official in the British Pharmacopœia, or the Pharmacopœia of the United States; but in the latter volume the bark of the root of Berberis vulgaris, *L.*, is placed in the Secondary List of the Materia Medica, and will therefore be described by us after that of Indian Barberry Bark.

Collection and Preparation.—The root-bark of Indian Barberry which is allowed in the Pharmacopœia of India to be taken indifferently from the three species of *Berberis* mentioned above, is directed in the same volume to be collected at the fall of the year, as it then most abounds in the bitter principle. The bark should also be stripped off whilst fresh, and then dried.

General Characters and Composition.—Indian Barberry Bark is in thin, brittle, slightly quilled or flat pieces. The outer surface has a corky texture and a light-brown colour; the inner surface is darker and somewhat greenish yellow, and has a shining appearance. It is almost inodorous, but has a very bitter, somewhat mucilaginous taste. These characters are, however, somewhat modified in the bark of the different official species.

Indian barberry bark has been proved by L. W. Stewart to owe its activity to the alkaloid *berberia*, which it contains in abundance.

Medical Properties and Uses.—A watery extract prepared from the wood or root of several species of *Berberis* growing in Northern India, and sold in the bazaars as *Rusot* or *Rasot*, has long been held in high esteem among the natives as a local application in various forms of eye disease, and as a febrifuge. Royle proved many years since that the *Indian Lycium* of the ancients was identical with this Rusot; and hence, in consequence of the recognised value of Indian Barberry, the root-bark was made official in the Pharmacopœia of India.

Indian Barberry bark is stated to be tonic, antiperiodic, and diaphoretic. It has been found of great value in intermittent and remittent fevers, and in debility after fevers; also in general debility, diarrhœa, dyspepsia, &c. In the form of extract (*rusot*), it is an esteemed local application, as already mentioned, in ophthalmia, and other affections of the eyes.

Pharmacopœia of India, pp. 12 and 435; Pharmacographia, p. 33; Royle on the Lycium of Dioscorides, in Linn. Trans., vol. xvii, p. 83; Simpson, Edinb. Monthly Journ. of Med. Sci., vol. xvi (1853), p. 24, also in Pharm. Journ., ser. 1, vol. xiii, p. 413; O'Shaughnessy, Bengal Disp. (1842), p, 203; Stewart, in Pharm. Journ., vol. vii, ser. 2, p. 303.

Other Official Species of Berberis.—Berberis; the bark of the root of Berberis vulgaris (U. S. P. *Secondary*).

General Characters and Composition.—Barberry bark has a somewhat corky appearance, a greyish colour on its outside, and is yellow on its inner surface. It has no odour, but a very bitter taste, and when chewed tinges the saliva yellow. It is mentioned by us when treating of "Punica Granatum," as being sometimes substituted for, or mixed with, pomegranate root-bark.

It owes its properties to the presence of two alkaloids, *berberia* and *oxyacanthin*, but more especially to the former. *Oxyacanthin* has also been named *vinetina* and *berbina*. It is described as a crystallizable, colourless alkaloid, of a purely bitter taste, nearly or quite insoluble in water, but freely soluble in alcohol, and forming with acids colourless crystallizable salts of a bitter taste. *Berberia* is referred to by us when treating of "Hydrastis canadensis" as a constituent of several medicinal substances, although first discovered in this bark, hence its name. It crystallises in the form of small silky needles, or concentrically grouped prisms, of a like yellow colour. It is without odour, but has a very bitter taste; it is sparingly soluble in water and alcohol when cold, easily at the boiling heat; and altogether insoluble in ether. It forms yellow soluble salts with vegetable acids. Klunge has recently given a very delicate test for berberia. It consists in adding chlorine water to an aqueous solution of the alkaloid, strongly acidified by sulphuric or hydrochloric acid. With $\frac{1}{10000}$th of berberia, a band of a lively red colour is formed at the point of contact, and on shaking the colour spreads throughout the liquid. With $\frac{1}{250000}$th of the alkaloid a rose tint is produced.

Medical Properties and Uses.—Barberry is said to be tonic in small doses, and cathartic in larger doses. It has been

used with success as a gentle purgative in jaundice, as, for instance, by the celebrated botanist, John Ray ; but its claims as a remedy in this disease, in which it was formerly held in great esteem, probably originally rested upon the doctrine of similitudes, by which it was supposed that as in jaundice the skin is yellow, so the yellow bark of the barberry indicated it as a remedy. It might probably be advantageously tried in similar cases to those in which Indian Barberry bark is employed.

Other Uses of the Plant.—Besides its medicinal use Barberry bark is also sometimes employed in the preparation of a yellow dye ; and barberry roots when boiled in an alkaline ley likewise yield a yellow dye, which is said to be used in Poland for colouring leather.

The ripe fruits of this and of other species of *Berberis* are acid and astringent, and form refreshing preserves and syrups; but they are too acid for eating in a fresh state. The ripe fruits of the common Barberry (*Berberis vulgaris*) are also sometimes candied ; and when green, they are occasionally pickled in vinegar. In some parts of Europe the ripe fruits are likewise used in the preparation of cooling, astringent, and antiscorbutic drinks, which are given in febrile diseases and diarrhœa.

U. S. Disp., by W. & B., p. 174; Gmelin's Chemistry, vol. xvii, p. 197; Watts' Dict. Chem., vol. i, p. 579; Treasury of Botany, by Lindley & Moore, p. 136; Perrins, in Pharm. Journ., ser. 2, vol. iv, p. 464; Chemist and Druggist for 1875, p. 115, from Journ. de Pharm. et de Chem., March, 1875.

DESCRIPTION OF PLATE.

Drawn from a specimen collected by Wallich in Nepal, in the British Museum (no. 1474). 1. A branch with flowers. 2. Vertical section of a flower. 3, 4, 5. Sepals. 6. A petal. 7. A stamen. 8. Ovary in section. 9. A fruit. 10. Section of the same. 11. A seed. 12. Vertical, and— 13. Transverse section of the same. (2–8, 11–13 enlarged.)

D.Blair ad nat del et lith

M&N.Hanhart imp

PODOPHYLLUM PELTATUM *Linn.*

N. Ord. Berberideæ.

Tribe *Berbereæ*.

Genus Podophyllum,* *Linn.* B. & H., Gen., i, p. 45; Baill., iii, p. 74. Species 2, one North American, the other from the Himalaya.

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17. Podophyllum peltatum, *Linn., Sp. Plant., ed.* 1, *p.* 505 (1753).

May-apple. Mandrake. Wild Lemon. (N. America.)

Figures.—Barton, ii, t. 25; Bigelow, ii, t. 23; Ehret, Plant. Select. (1750), t. 29; A. Gray, Ill. Genera, tt. 35, 36.

Description.—A perennial herb with a much elongated creeping rhizome, reaching 6 feet in length, which is cylindrical, rarely branched, dark brown, marked with the scars of the scales which clothe it when young, and at intervals of 2 or 3 inches with the bases of the flowering stems of previous years, terminating in an erect flowering stem, its growth in the horizontal direction being continued by a bud at the base of the flowering stem. Roots given off at each joint of the rhizome, fibrous, rather thick, simple. Stems either flowerless or flowering, erect, about a foot high, cylindrical, smooth, pale green or pinkish. Leaves on the flowerless stems solitary, peltate; on the flowering stems two, opposite, terminating the stem, petioles about 3 inches long, erect, curved, cylindrical, blade horizontal or somewhat inclined, about 5 inches wide, very deeply palmately cut into 5—7 oblong or inversely wedge-shaped segments coarsely toothed or cut at their ends, perfectly glabrous and shining, wavy, rather glaucous green. Flower solitary, about 2 inches across, on a short, strongly curved peduncle, coming off from the fork between the two leaves, with three small fugacious bracts beneath the flower. Sepals 6, unequal, quickly caducous, blunt, pale green, imbricate. Petals 6—9,

* Name from πούς, a foot, and φύλλον, a leaf, from the resemblance of that organ to the foot of some aquatic birds.

hypogynous, twice as long as the sepals, obovate-oval, nearly equal, delicate, finely veined, white, soon falling. Stamens 12—18, hypogynous, filaments slender, short, anthers linear, about as long as the filaments, 2-celled, bursting longitudinally. Pistil superior, composed of one carpel; ovary ovoid, smooth, one-celled, longer than the stamens, with numerous ovules arranged in many rows on the parietal (ventral) placenta; stigma almost sessile, large, thick, peltate, lobed and undulated. Fruit a yellowish berry, usually $1\frac{1}{2}$ to 2 inches long, ovoid, soft, and fleshy, indehiscent. Seeds about 12 or more, attached to the greatly enlarged placenta, yellow, each surrounded by a pulpy aril, which nearly encloses it, the whole forming a soft mass which completely fills the cavity of the fruit; embryo small, at the base of the abundant endosperm.

Habitat.—This pretty plant is very common in rich moist woods throughout the United States and Canada, and is in flower in May. The fruit is not ripe till the autumn, and is somewhat sparingly produced; it has a very pleasant subacid flavour, and varies much in size, but is usually about as large as a plum. The May-apple will grow in England, where it was first cultivated in 1664, and is to be seen in most botanic gardens.

Hook, Fl. Bot. Am., i, p. 31; A. Gray, Man. Bot. U. S., p. 54; Chapman, Fl. South. States, p. 18; DC. Prod., i, p. 111; Lindl., Fl. Med., p. 13.

Official Parts and Names.—1. Podophylli Radix; the dried rhizome: 2. Podophylli Resina; the resin (B. P.). The dried rhizome (I. P.). Podophyllum, *May-apple;* the rhizome (U. S. P.).

1. Podophylli Radix. *Podophyllum Root. May-apple Root.*—*Collection and Commerce.* The root, or as it is more correctly termed the rhizome, is most active when obtained after the leaves have fallen; this is commonly the case about August, at which period it is therefore generally collected, and then dried for use. The dried rhizome is but rarely used in itself as a medicinal agent, but almost entirely for the preparation of the resin, the

Resina Podophylli of the Pharmacopœias, which is described below. This rhizome is imported from North America.

General Characters and Composition.—Podophyllum root, as it is commonly termed, consists of the rhizome and rootlets. In commercial specimens the rootlets are frequently altogether absent, but when present they are either attached to the lower surface of the rhizomes, or are mixed in a loose state with them. The rhizome is either simple or branched. In length it varies from about an inch to eight or more inches; and in thickness from two to four lines. The rhizome has commonly a somewhat flattened appearance, and if not much broken up it presents, at more or less distant intervals, large irregular tuberosities, which are marked above by a depressed scar indicating the point where the aerial stem was attached, and giving off below a variable number of rootlets, or when these are broken off their position is marked by whitish scars. The rhizome has a reddish- or blackish-brown, or reddish-yellow colour, and its surface is smooth or furrowed longitudinally. The rootlets vary in length, and in size they average about that of a common knitting-needle; they are smooth and somewhat lighter coloured than the rhizomes. Both the rhizome and rootlets are brittle, and their fracture is short, smooth, whitish, and mealy; their powder is of a yellowish-grey colour. The taste of both rhizome and rootlets is bitterish, acrid, and nauseous; and their odour disagreeable and narcotic, more especially when moistened with warm water.

The active purgative properties of podophyllum rhizome are due entirely to the resin, which is described below under its official name of Podophylli Resina. In addition to the resin, podophyllum rhizome also contains, as discovered by F. F. Mayer, of New York, a large proportion of the alkaloid *Berberine* or *Berberia;* and also *Saponine,* and another *colourless alkaloid,* which has not been yet further described; as well as an *odoriferous principle,* and some other unimportant substances.

2. Podophylli Resina. *Resin of Podophyllum. Resin of May-apple.*—This resin is largely manufactured in Cincinnati and in other places in the United States of America and elsewhere,

under the incorrect name of *Podophyllin*. It is contained in the proportion of 3½ to 5 per cent. in both the rhizome and rootlets. The best solvent of the resin is alcohol, and hence rectified spirit or alcohol is directed to be used in its preparation in the British Pharmacopœia, in the Pharmacopœia of India, and in the Pharmacopœia of the United States. As prepared, according to the directions of the British Pharmacopœia, it is a pale brownish-green amorphous powder, with an acrid bitter taste. It is entirely soluble in rectified spirit and in ammonia. It is precipitated from the former solution by water, and from the latter by acids. It is only partially soluble in ether.

Medical Properties and Uses.—Both the rhizome and the resin have been long held in high esteem in the United States as efficient hydragogue cathartics; and in small doses frequently repeated, as alteratives. The rhizome is, however, but now little employed, all its essential properties being concentrated in the official resin, which is by far the best form of administering this drug, and the one now generally in use. Many American physicians consider that they can use the resin in all cases with perfect safety and confidence where mercury is indicated, as they say it produces all the good, and none of the evil effects of mercurial preparations; hence, it has received the name of "Vegetable Calomel." The griping effects which are often produced by its use may be prevented by combining with it small doses of extract of henbane. As it is sometimes very uncertain in its action, it is better to prescribe it in combination with other purgatives, more especially aloes or colocynth. It has been largely used in constipation, and in affections of the liver generally, but more especially in congestion of that organ. It is also frequently employed in combination with acid tartrate of potash in dropsies; and in various rheumatic, scrofulous, and syphilitic affections it has been used with advantage. In small frequently repeated doses the resin has also been recommended as an alterative in bronchitic and pulmonary affections. Externally applied the resin of podophyllum acts as a powerful irritant, and in America it has on this account been used, when dissolved in alcohol, as a counter irritant.

Per. Mat. Med., by B. and R., p. 1007; Pharmacographia, p. 35; U. S. Disp., by W. and B., p. 692; Garr., Mat. Med., p. 184; Bentley, in Pharm. Journ., vol. iii, 2nd ser., p. 457; Journ. of the Philadelphia Coll. of Pharm., vol. iii, p. 273; Maisch., in Amer. Jl. Pharm., July, 1863, p. 383; Mayer, in Amer. Journ. of Pharm., March, 1863, p. 98; Amer. Journ. Pharm., vol. xix, p. 165, and vol. xxiv, p. 306; Ueber Podophyllin (Dissertation). Giessen, 1869.

DESCRIPTION OF PLATE.

Drawn from a specimen cultivated in Kew Gardens; the fruit added from A. Gray.

1. A bud.
2. Vertical section of flower.
3. Transverse section of ovary.
4. Vertical section of fruit.
5. A seed showing the fleshy arillus.
6. Section of seed.

(5, 6 enlarged.)

5
4
6
7
2

D.Blair ad nat. del. et lith.

M & N Hanhart imp

PAPAVER SOMNIFERUM, *Linn.*

N. Ord. PAPAVERACEÆ. Lindl. Veg. Kingd., p. 430; Le Maout & Dec., p. 214; Baill., Hist. Pl., iii.

Tribe *Papavereæ*.

Genus **Papaver**,* *Linn.* B. & H., Gen., i, p. 51; Baill., Hist. Pl., iii, p. 137. Species about 20, natives of the temperate and warm regions of the Old World.

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18. Papaver somniferum, *Linn., Sp. Plant., ed.* 1, *p.* 508 (1753).

Opium Poppy. White Poppy.

Syn.—P. officinale, *Gmel.* P. hortense, *Huss.* P. setigerum, *DC.*

Figures.—Woodville, t. 138; Hayne, vi, t. 40; Nees, tt. 404, 405; Steph. & Ch., t. 159; Berg & Sch., t. 15 e; Baill., l. c., figs. 112—118; Syme, E. Bot., i, t. 57 (*P. hortense*); Reichenb., Ic. Fl. Germ., iii, t. 17; Delessert, Ic. Select., ii, t. 7 (*P. setigerum*).

Description.—An annual, with a thick, tapering, much-branched, yellow root. Stem reaching (in the cultivated plant) over 3 feet in height, and a diameter of ½ inch at the base, erect, cylindrical, solid, quite smooth or with a few scattered, bristly, horizontal hairs, pale green covered with a white bloom, more or less branched. Leaves rather numerous and closely placed, alternate, sessile, spreading horizontally, the lower ones never more than 6 inches long, oval-oblong, tapering at the base, deeply pinnatisect with acute segments, and deeply and irregularly dentate, the upper ones reaching as much as 10 inches in length, gradually becoming wider and with a more cordate base, the uppermost ones very broadly ovate, with a deeply cordate amplexicaul base, not pinnatisect but more strongly and deeply toothed, the teeth tipped with callous white points, all quite smooth and shining (or the root-leaves with a few bristly hairs beneath), rather thick, dull green, covered with a glaucous-white bloom, which is readily removed, slightly paler beneath, and with prominent veins, midrib very wide, nearly white. Flowers few, solitary, very large, 3—7 inches across, terminating the stem and branches, erect, buds ovate-ovoid,

* *Papaver*, the classical Latin name; the Greek name was *μήκων*.

drooping. Sepals 2, broad, blunt, quite smooth, of the same colour as the leaves, disarticulating and pushed away as the flowers expand. Petals 4, very large, decussate, the two outer wider than long and much overlapping the narrower inner ones, concave, undulated, with numerous closely-placed veins, radiating from the stiff, thick, wedge-shaped base, satiny and shining, variable in size and colour, in the (English) cultivated plant pure snow-white with a pale greenish-yellow base, in the wild one pale violet, with a large wedge-shaped dark purple or nearly black spot at the base, crumpled in the bud, soon falling. Stamens very numerous, hypogynous, inserted in 5 or 6 rows on the under surface of the dilated gynophore, erect, filaments more than 1 inch long, narrow linear, flat and ribbon-shaped, slightly dilated at the top, white, anthers linear, about $\frac{1}{4}$ inch long, attached by a very narrow base to the filaments, cream-coloured, becoming pale-brown and twisted after dehiscence. Ovary large, depressed globular, about 1 inch in diameter, the top scarcely on a level with the anthers, very suddenly contracted below into a neck (gynophore) about $\frac{1}{4}$ inch wide, which again dilates to form the receptacle which narrows off below into the peduncle, more or less faintly channelled vertically, quite smooth, pale green, one-celled, with large spongy parietal placentæ, equal in number to and beneath the stigmatic rays, passing nearly to the centre, and bearing numerous ovules scattered over all parts of their surface; stigma sessile, peltate, narrower than the ovary, spreading or curved over its top, with 8—20 short, obtuse, oblong rays. Fruit usually more or less globular, often somewhat depressed, or ovoid, $1\frac{1}{2}$—3 inches in diameter, supported on a neck (as in the ovary) and crowned by the persistent stigma, pericarp dry, hard, brittle, smooth, brownish-yellow usually speckled with black, indehiscent or dehiscing by small apertures beneath the stigmatic crown, one-celled, with the dry papery placentæ reaching about half-way to the centre. Seeds very numerous, very small, reniform, white, grey, violet or black, testa with a raised reticulated network, embryo slightly curved, in the axis of the oily endosperm.

Habitat.—It cannot be said that the opium poppy is known any-

where in a thoroughly wild condition; even the form called *P. setigerum*, DC., which has best claims to be considered so, being found in situations due to cultivation, &c. The home of the plant is, however, in all probability, south-eastern Europe and Asia Minor. At the present time it is met with throughout Europe and Asia, north-western Africa and North America, and is found in waste and cultivated ground and not unfrequently as a corn-field weed. In England it occurs sporadically and not unfrequently, especially in the south, and in a few chalky districts is a common weed in the corn; many of its localities are due to garden cultivation, all the various forms of the favourite ornamental annual Poppy being derived from this species.

The cultivation of the Poppy for opium dates from antiquity, and was carried on in Asia Minor, Italy, and Greece in classical times. The spread of its culture through the nations of Asia appears to have been primarily due to the Arabs. It may be grown for this purpose in any warm country in suitable soil, but the yield of opium in temperate regions, though of equal quality, is small; at the present time the great opium-producing countries are India, China, Asia Minor, and Persia, where immense tracts of the best and most fertile soil are occupied by poppy-cultivation.

The plant is also grown in many parts of Europe for the capsules and seeds—Poppy-heads and Maw seed. In England, Mitcham, parts of Hertfordshire and Bedfordshire, and near Banbury, are the principal localities. But in consequence of the expense and uncertainty of its cultivation, and the large quantities of poppy heads which are imported in a broken state, &c., the crop is not generally a profitable one; its cultivation is, therefore, mostly carried on only to a limited extent. Mr. Usher, of Bodicote, near Banbury, who is one of our largest growers, has afforded the following information. The plant blossoms about the middle of July, and the petals close during the night, when the leaves also assume a perpendicular direction, the former, however, remain on only for about 24 hours; the pistil, which is at the fall of the petals comparatively small, grows with great rapidity and attains its full growth in 8 or 9 days. The size of the capsule of the English-grown plant is about

twice as great as that of the opium poppy of India, but is exceeded by some continental (German) heads. A remarkable strong tendency to variation is shown by *P. somniferum* in cultivation, and a constant careful selection of seed is necessary. The petals should be pure white, and when this is the case the capsule is large and the seed also white. But the petals are liable to become various shades of pink, purple, or almost black, and in exact proportion to this coloration of the petals so do the seeds assume lighter or darker shades of pink or black; at the same time the capsule diminishes in size and in the dark-seeded varieties is often very small.

Botanists recognise several varieties of *P. somniferum* with characters based on the form of the capsule, the number of component carpels and the presence or absence of apertures. The plants so largely cultivated for opium in Persia and India have a more or less ovate or oblong capsule without pores (var. *album*, Boiss.)*; that grown in Germany for its "heads" has the large capsules strongly ribbed along the lines of union of the component carpels.

Syme, E. Bot., i, p. 82; Boissier, Fl. Orient., i, p. 116; Fl. Brit. Ind., i, p. 117; DC. Syst. Veget., ii, p. 81; Alefeld, Landwirthschaft. Flora, p. 281; Lindl., Fl. Med., p. 38; Flück. & Hanbury, Pharmacogr., p. 38.

Official Parts and Names.—Papaveris Capsulæ; the nearly ripe dried capsules, cultivated in Britain: 2. Opium; the juice, inspissated by spontaneous evaporation, obtained by incision from the unripe capsules of the poppy, grown in Asia Minor (B. P.). 1. The nearly ripe capsules, dried and deprived of the seeds: 2. Opium; the inspissated juice obtained by incision from the capsules of the growing plant (I. P.). 1. Papaver; the nearly ripe capsules: 2. Opium; the concrete juice obtained from the unripe capsules, by incision and spontaneous evaporation (U. S. P.).

Besides the above drugs two of the peculiar principles of Opium, and some of their salts, are also official. Thus in the British Pharmacopœia, Acetate of Morphia and Hydrochlorate of Morphia are

* These are figured in Dr. de Lanessan's recently published French translation of 'Pharmacographia,' vol. i, pp. 105, 108.

recognised: in the Pharmacopœia of India, Acetate and Hydrochlorate of Morphia; and Narcotine are official: and in the Pharmacopœia of the United States, Morphia, and three of its salts, namely, Acetate of Morphia, Muriate (Hydrochlorate) of Morphia, and Sulphate of Morphia, are official.

1. Papaveris Capsulæ.—*Collection.*—The capsules are directed to be collected when *nearly ripe*, at which period they have been proved by the analyses of Meurein, Aubergier, and others, to contain most morphia. Buchner, however, states that at this period they are less active than when gathered *quite ripe*. It is also sometimes said that, if collected before they are ripe, their contained juice being then in a more liquid state, is, to a great extent, lost by flowing out of the wound produced in cutting off the capsules, unless great care be taken in inverting them upon their crowns during the process of drying. Most observers, however, agree as to the greater activity of the capsules when collected before they are ripe; although, in practice, the direction of the Pharmacopœia does not appear to be very strictly adhered to. At Banbury, the poppy capsules are usually gathered at the end of August or beginning of September, and are then dried in kilns, the process occupying about twelve hours. The finest capsules are commonly sold entire, while the smaller and less showy ones are broken up, divested of their seeds, and supplied to the pharmacist for making the official preparations. It should be noticed however, that in the British Pharmacopœia, while the seeds are directed to be removed in making the official Extract and Syrup of Poppies, no such direction is given with the Decoction, the bruised poppy capsules being there alone mentioned, and obviously for the purpose of retaining the seeds, as they contribute, by their oily properties, to the emollient quality of the decoction.

General Characters and Composition.—Dried *poppy capsules* or *poppy-heads* vary in size from that of a hen's egg to that of the fist, or from two to three inches in diameter. They also vary in form, being rounded or ovoid-rounded, according to the variety of poppy from whence they have been obtained; but there does not appear to be any essential difference in the medical properties of these

varieties. They are crowned by the stellately-arranged stigmas; their texture is papyraceous; and their colour is yellowish or yellowish-brown, frequently dotted with blackish spots. When *fresh* they have a narcotic odour and a bitter taste; their odour is, however, entirely destroyed by drying, but their bitterish taste is to some extent retained. The dried capsules contain a large number of loose seeds, which are white, somewhat slate-coloured, or nearly black, according to the variety of poppy from whence they have been procured; the dark-coloured ones are commonly known as *maw seeds*. This name is also sometimes applied generally to poppy seeds of whatever colour. Poppy seeds have an oily, sweetish taste, and are altogether destitute of the narcotic properties of the pericarp.

Poppy capsules contain a small quantity of the more important principles found in opium, but the analyses of different chemists yield very varying results; thus, while Merck and Winckler have found *morphia* to the extent of 2 per cent. in the ripe fruit, and Groves, Deschamps d'Avallon, and other chemists have also shown its presence, others have failed to find it. These discrepant results are no doubt owing, in a great measure, to the period when the capsules have been collected, for Meurein and Aubergier have proved that they contain most Morphia before they are ripe, and hence, as already indicated, they should be collected for medicinal use at this period. The presence of *Codeia* was inferred by Groves; and Deschamps d'Avallon and Krause have also found *Narcotine*. Deschamps d'Avallon has likewise ascertained the presence of *meconic, tartaric,* and *citric acids,* a kind of *mucilage,* other unimportant constituents, and two new crystalline bodies, which he has termed *papaverin* and *papaverosine*. The former is said to have an acid reaction, and is therefore different from the alkaloid of the same name discovered by Merck in opium; the latter possesses basic properties. Hesse also found *rhœadine* in ripe poppy capsules; this principle is referred to in our descriptions of *Papaver Rhœas* and *Opium*.

Medical Properties and Uses.—The preparations of poppy capsules are similar in their effects to, but are much weaker and less to be

depended upon than, those of opium. But the official extract is frequently substituted for the preparations of opium on the supposition that, while it allays pain and promotes sleep, it is less liable to occasion nausea, constipation, headache, and delirium. The syrup is frequently used to allay cough, and as an opiate for children; but when given to the latter, its administration requires the greatest caution, on account of its uncertain strength, and the susceptibility of infants to the influence of opiates. The decoction is a common anodyne and demulcent fomentation when applied hot to inflamed parts, bruises, sprains, and other painful affections.

Uses of the Seeds.—The seeds have no narcotic effects, but yield by expression a fixed oil, which is largely used in India and some other parts of the world for burning in lamps, and for food. This oil is also a common adulteration of olive oil in this country and elsewhere, and the cake left after its expression may be used as a cattle food. The oil is also employed by painters. In Poland, Greece, and elsewhere, the seeds themselves are said to be eaten, and to have an agreeable nut-like flavour. The dark-coloured seeds, as we have already stated, are called *maw seeds*. They are used as a medicine for birds, and are largely eaten by them.

Per. Mat. Med., by B. & R., p. 940; Pharmacographia, p. 39; U. S. Disp., by W. & B., p. 659; Treasury of Botany, by Lindley & Moore, pt. 2, p. 842; Meurein, Journ. de Pharm., 3 ser., vol. xxiii, p. 341; Groves, in Pharm. Journ., vol. xiv, ser. 1, p. 203; Holmes, in Pharm. Journ., vol. vii, ser. 3, p. 1018; Krause, in Proc. Amer. Pharm. Assoc., vol. xxiii, 1875, from Arch. Ph., Dec., 1874, p. 507.

2. Opium.—*Extraction, Collection, and Preparation.*—The mode of extracting opium is essentially the same in all countries, although it varies somewhat in its details; it consists in making incisions into the unripe capsules, and collecting the juice when concreted into tears. After collection, the masses of tears are either worked up into a homogeneous mass in a mortar or otherwise, as in Egypt and India; or the separate masses are merely put together without being incorporated, as is commonly the case

in Asia Minor and Persia. When prepared according to the latter method, if the opium be examined by a magnifying lens, it is seen to be composed of agglutinated tears, and may be therefore termed *granular opium;* while in the former the opium appears perfectly homogeneous, and may be called *homogeneous opium.* As the opium obtained in Asia Minor is by far the more important variety known in Europe and the United States, and that which is alone recognised in the British Pharmacopœia, it will be sufficient for us to give generally the mode of extraction, collection, and preparation, which is there adopted, and for which we are chiefly indebted to published accounts of Maltass and Heffler. It is as follows:—About the end of May, or sometimes even as late as July, according to the elevation of the land where the *Papaver somniferum* is cultivated, the plants, which are the variety *glabrum* of Boissier, arrive at maturity, and the flowers expand. A few days after the petals have fallen, and when the capsule is of a light green hue, it is ready for incision, which is performed in the afternoon, and in the following manner:—A transverse incision is made with a knife about the middle of the capsule, the incision being carried round until it arrives nearly at the part where it commenced; or, sometimes, it is continued spirally to half-way beyond its starting-point; and in rare cases it is also incised vertically as well. The greatest precision is necessary in making the incision, for should it be too deep, and the interior coating of the capsule be also cut, the exuding juice would then flow into the inside and be lost; and if the incision be not deep enough, all the juice would not ooze out. It is also stated that in the former case, the seeds will not ripen, and no oil can then be obtained from them. The following morning those engaged in collecting the opium lay a large poppy leaf on the palm of the left hand, and having a suitable knife in their right hand, they scrape the opium which has exuded from the incision in each capsule during the night, and then transfer it from the knife to the leaf. At every alternate scraping the knife is wetted with saliva by drawing it through the mouth to prevent the half-dried juice adhering to it. Each poppy capsule is, as a

rule, only cut once, but as each plant produces several capsules which do not arrive at maturity at the same time, it is usual to pass over the field a second or even a third time, in order to incise such capsules as were not ready at the first cutting; and then the opportunity is also taken of recutting such capsules as exceed the usual size. As soon as a sufficient quantity of the half-dried juice has been collected to form a cake or lump, it is wrapped in poppy leaves, and put for a short time to dry in the shade. There is no given size for cakes of opium, and they vary very much, being from a few ounces to two or more pounds.

The cultivators, who are small land proprietors, then sell the opium to the merchants in the interior, and by these the opium is at once packed in bags together with the chaffy fruits of a species of *Rumex* to prevent the lumps from sticking together; after which the bags are sealed and placed in wicker baskets of an oblong shape, and forwarded chiefly to Smyrna, although some of a superior quality is sent direct to Constantinople. But in some cases it would appear that the drug, which is purchased in a soft state, is incorporated into larger masses by means of a wooden pestle, then enveloped simply in poppy leaves, and afterwards packed in bags sealed as before, and forwarded to Smyrna. The opium after being sold at Smyrna is transported to the buyer's warehouse, when the seals of the bags are broken in the presence of the buyer, seller, and a public examiner, the latter of whom inspects the drug carefully, and rejects any of suspicious quality. The examination of opium is not carried on after any scientific method, but its quality is judged of by its colour, odour, appearance, and weight; nevertheless, the estimate is generally correct.

At the present time, the largest quantity of opium is produced in the north-west of Asia Minor, in the districts of Karahissar Sahib, Balahissar, Kutaya, and Geiveh. It is also produced in Angora and Amasia in the north of Asia Minor; and to a limited extent in other districts. The export from Smyrna in 1870 was 5650 cases, valued at £784,500, the crop in this year was, however,

very much beyond the average; the exports before 1870 averaging about 300,000 lbs. annually.

General Characters and Test.—The characters of opium are given in the British Pharmacopœia as follows:—Irregular lumps weighing from four ounces to two pounds, enveloped in the remains of poppy leaves, and generally covered with the chaffy fruits of a species of Rumex; when fresh, plastic, tearing with an irregular, slightly moist, chestnut-brown surface, shining when rubbed smooth with the finger, having a peculiar odour and bitter taste.

The following is the test of opium as given in the British Pharmacopœia:—Take of opium one hundred grains, slaked lime one hundred grains, distilled water four ounces. Break down the opium, and steep it in an ounce of the water for twenty-four hours, stirring the mixture frequently. Transfer it to a displacement apparatus, and pour on the remainder of the water in successive portions, so as to exhaust the opium by percolation. To the infusion thus obtained, placed in a flask, add the lime, boil for ten minutes, place the undissolved matter on a filter, and wash it with an ounce of boiling water. Acidulate the filtered fluid slightly with diluted hydrochloric acid, evaporate it to the bulk of half an ounce, and let it cool. Neutralise cautiously with solution of ammonia, carefully avoiding an excess; remove by filtration the brown matter which separates, wash it with an ounce of hot water, mix the washings with the filtrate, concentrate the whole to the bulk of half an ounce, and add now solution of ammonia in slight excess. After twenty-four hours collect the precipitated morphia on a weighed filter, wash it with cold water, and dry it at 212°. It ought to weigh at least from six to eight grains.

Varieties of Opium.—The varieties of opium which have been distinguished by pharmacologists are Smyrna, Constantinople, Egyptian, Persian, European, East Indian, and Chinese. Some opium has also been produced in the United States, Algeria, and Australia. Of these varieties, only the four first are ordinarily found in European and American commerce; and of these, again,

Maltass has shown that there is no real difference between the Smyrna and Constantinople varieties, both being the produce of the same districts, from which they are forwarded as described above under the head of Extraction, Cultivation, and Preparation of Opium, to Smyrna or Constantinople for sale, and are thence exported, but more particularly from Smyrna, to other parts of the world. These two latter varieties, which are the produce of Asia Minor, are those alone which are official in the British Pharmacopœia, and to which the characters and test of opium given above apply. Both will be described by us under the name of Asia Minor Opium. This and the two other commercial varieties of opium can alone be particularly noticed here, for the European opium, which is known by the names of the countries where produced as English, French, German, Italian, Swedish, &c., although in many cases not inferior to that of Asia Minor, is only of local interest; and the East Indian and Chinese varieties are either consumed in the countries whence produced; or in the case of East Indian also exported in enormous quantities to China, &c. Thus at least eight millions of pounds of East Indian Opium are annually exported to China, representing a market value of about as many pounds sterling. For a description of these other varieties of opium, reference must be made to special treatises on Pharmacology.

1. *Asia Minor Opium.*—Under this head we include all opiums which are known as *Smyrna, Constantinople, Turkey,* or *Levant.* It is the produce of *Papaver somniferum,* var. *glabrum* of Boissier. It occurs in irregularly rounded or flattened masses, which vary commonly in size from about eight ounces to two pounds, but smaller and larger lumps may be also found. Externally the lumps are usually covered with portions of poppy leaves scattered over with the reddish-brown chaffy fruits of a species of *Rumex.* In some masses, in consequence of their having been much handled, the pericarps are more or less separated from the fruits; so that the seeds are alone found upon the surface; and in the kind of opium formerly distinguished as Constantinople, the rumex fruits are generally entirely absent, the surface being covered with poppy leaves only. When first imported, the interior is moist

and coarsely granular in appearance, and small shreds of the epicarp of the poppy capsule are commonly to be observed in its substance; the colour is reddish- or chestnut-brown. By keeping the masses become harder and blackish-brown, or even quite black if kept for many years. The odour is strong, peculiar, narcotic, and unpleasant to most persons, although to others it is by no means disagreeable; the taste is nauseously bitter. This is, as a rule, the best kind of opium, yielding on an average a larger proportion of morphia than any of the other kinds; according to the British Pharmacopœia it should yield from 6 to 8 per cent. at least. Opium much richer in morphia may, however, be met with. The above proportions are those found in the drug as imported in its fresh and soft state. When dried, in which condition it should be alone used for pharmaceutical preparations, the authors of Pharmacographia say, "that good Smyrna opium ought to afford 12 to 15 per cent. of morphine, and that if the percentage is less than 10, adulteration may be suspected." In the Pharmacopœia of the United States it is also stated, that opium, when dried at 212° until it ceases to lose weight, should yield at least 10 per cent. of morphia by the official process.

Adulterations.—Smyrna opium is frequently adulterated, and with various substances, such as sand, pounded poppy capsules, gum tragacanth, pulp of figs or apricots, gum arabic, molasses, starch, sugar, &c. It is also by no means rare to find bits of clay, stones, bullets, and other foreign matters in the masses; and, in some instances, opium is found in commerce from which the morphia has been extracted. The only reliable test of the purity and quality of opium is the proportion of morphia it yields.

2. *Egyptian Opium.*—This kind is obtained from the same variety of *Papaver somniferum* as that from which Asia Minor Opium is procured; but comparatively little, much less than formerly, is now met with in Europe and the United States. As usually seen it is in flattish or plano-convex cakes from 3 to 4 inches in diameter, and covered externally with portions of poppy leaves; but no rumex fruits are found. Formerly, the cakes of

Egyptian opium were always covered with the remains of a leaf with radiate venation, which one of us ascertained to be that of the Oriental Plane (*Platanus orientalis*). It is usually very hard and dry, although sometimes soft and plastic. It is distinguished from Asia Minor Opium by its dark liver colour, and by not blackening by keeping. Its odour is also less strong, and somewhat musty. It is frequently adulterated, and, as a rule, very inferior to Smyrna opium; but its quality varies much, for while ordinarily, as imported, it only yields 3 or 4 per cent. of morphia, in other cases as much as 8 per cent. has been found. Some chemists have also extracted much narcotine from this variety of opium.

3. *Persian Opium.*—This is the Trebizond opium of Pereira. It is derived from *Papaver somniferum*, var. *album*, of Boissier. It is found in various forms, thus, in somewhat flattened cylindrical sticks, in short rounded cones, in flat circular cakes, and in roundish irregular lumps. The sticks, which are of very inferior quality, are about six inches in length, and about half an inch in diameter. Each one is enveloped in a smooth shiny paper, and tied with cotton. The other forms of Persian opium are either covered with broken stalks and leaves, or wrapped in paper. Fine Persian opium has a firm consistence, a good opium smell and taste, and a light brown, somewhat reddish colour. Some Persian opium has a greasy exterior, and when cut globules of oil may be seen in its interior. This oily character is caused by its being collected with a flat scraper or knife moistened, as well as the fingers of the gatherer, with linseed oil. Persian opium has been largely imported of late years, and although its quality is frequently very inferior, yielding only from one half to three per cent. of morphia in its undried state, or even less than this; the best samples in their fresh condition, yielded Howard, from 8 to 10·75 per cent. of morphia.

Composition.— By far the most important constituent of opium is *morphia*, and hence the quality of opium is judged of by the yield per cent. of this alkaloid; it is combined with a peculiar acid called *meconic acid*. Besides these constituents, opium

contains a number of other principles, some of which have basic, and others neutral properties. In many cases, however, the principles extracted from opium are secondary or derivative constituents, which are produced in the processes employed by the chemist for the separation of its primary or natural constituents. Some of the other constituents of opium, besides *morphia* and *meconic acid*, which have been indicated, are—*codeia*, *narcotine* or *narcotia*, *thebaia*, *narceia*, *papaverine*, *meconine* or *opianyl*, *cryptopia*, *pseudomorphia*, *codamine*, *laudania*, *lanthopine*, *protopia*, *laudanosia*, *hydrocotarnia*, and *rhœadine*; besides a number of derivatives, of which *apomorphia* is amongst the more important in a medicinal point of view. Opium also contains mucilaginous, albuminous, and extractive matters, and other unimportant substances; it is also said to contain *lactic acid*, but this substance is probably not an original constituent, but a derivative compound. For a description of these various constituents of opium we must refer to special treatises on chemistry and pharmacology. As already noticed, only two of the peculiar principles of opium, namely, Morphia and Narcotine, are official.

Medical Properties and Uses. — Pereira says, "Opium is, undoubtedly, the most important and valuable remedy of the whole Materia Medica. For other medicines we have one or more substitutes; but for opium none,—at least, in the large majority of cases in which its peculiar and beneficial effects are required." We might, perhaps, add to this, that while its proper use is of such inestimable value, its enormous consumption by the habitual opium eater, and in other ways, probably causes more misery to the human race than any other drug. The primary effect of opium when administered in medicinal doses is stimulant; its secondary effects soporific, anodyne, and antispasmodic. In overdoses it is a powerful poison, causing intense sleepiness, which passes "into a condition of stupor or coma, with gradually increasing slowness of respiration, feebleness of pulse, cold perspiration, and contracted pupils, followed by death." Its effects are principally exerted on the brain and nervous system, and through the latter it affects, more or less, every organ of the body. Its action

on the skin is to cause a free perspiration; but with this exception opium diminishes every secretion of the body. Opium is given in nearly all cases where the object is to allay pain and spasm, or to produce sleep; indeed its uses are so many and so various that it is altogether beyond our limits and objects to do more than briefly indicate them; for a detailed notice reference must be made to special treatises on therapeutics and pharmacology. In painful inflammatory affections, as in peritonitis, acute pleurisy, pneumonia, orchitis, &c., the influence of opium is most marked. In certain stages of fevers, especially when attended with delirium and active cerebral excitement, opium is also commonly most valuable. In delirium tremens and allied affections opium is our sheet anchor. In hæmorrhages; mucous discharges, such as diarrhœa, leucorrhœa, &c.; in genito-urinary diseases, to diminish the amount of urine, as in diabetes, or to allay irritability of the bladder, uterus, &c., opium is also frequently of great value. In the passage of gall-stones, or of renal calculi, it is of the greatest benefit. In cholera it has been largely used, but with doubtful advantage. Its employment in chest affections requires much caution, for although it frequently allays the cough, it sometimes causes increased dyspnœa; it also lessens expectoration, which is not at all times desirable. In rheumatic and neuralgic affections; in simple, cancerous, and gangrenous ulcerations; in strangulated hernia, colica pictonum, and in numerous other affections, the use of opium is also frequently attended with the best results.

As an external application opium is likewise valuable in allaying pain in various neuralgic, rheumatic, and other painful affections, as inflamed joints, &c.; and also in ophthalmia and other diseases of the eye, &c.

In its effects generally *morphia* resembles opium, hence it is to this alkaloid that opium owes its most valuable properties—that is, its anodyne and soporific effects, but it is much less stimulant in its action, and does not produce the full diaphoretic influence of opium. Morphia is generally regarded as more agreeable in its action than opium, from causing less headache, nausea, and constipation than it. Nevertheless, opium is generally preferred to

morphia for internal administration, for in many cases this alkaloid and its salts fail to produce the same beneficial effects as the crude drug. Of late years, however, morphia and its salts have been extensively used for hypodermic injection. When thus used locally to allay pain, as in neuralgic and rheumatic affections, &c., it causes less constitutional disturbances than when administered internally; its effects are more rapid; the dose required is much smaller; and in some cases, at least, it gives more evident and lasting relief.

The effects of *narcotine* (the only other official principle of opium) are tonic and antiperiodic, and in large doses diaphoretic. It is altogether devoid of narcotic properties, for it has been given by Garrod and other physicians in large doses without causing any narcotic symptoms. Waring says, that it has been administered with excellent effect in the East, "in intermittent fevers, in general debility, especially in that produced by prolonged lactation, and in convalescence after acute febrile and inflammatory diseases." Hence it has been made official in the Pharmacopœia of India.

Per. Mat. Med., vol. ii, pt. 2, p. 588; Per. Mat. Med., by B. & R., p. 943; Pharmacographia, p. 42; U. S. Disp., by W. & B., pp. 627 and 1287; Garr. Mat. Med., p. 199; Royle's Mat. Med., by Harley, p. 754; Pharmacopœia of India, pp. 15 and 22; Eatwell, in Pharm. Journ., vol. xi, ser. 1, pp. 269, 306, and 359; Maltass, in Pharm. Journ., vol. xiv, ser. 1, p. 395; Heffler, in Pharm. Journ., vol. x, ser. 2, p. 434, from Amer. Journ. of Pharmacy, July, 1868, p. 362; Simmonds, in Pharm. Journ., vol. ii, ser. 3, p. 986; Amer. Journ. of Pharm., vol. xviii, p. 124, and Journ. Soc. of Arts, vol. xx, p. 58; Pharm. Jl., vol. i, ser. 3, p. 272; Pharm. Journ., vol. iv, ser. 2, p. 199; Deane & Brady, in Pharm. Journ., ser. 2, vol. vi, p. 234, and vol. vii, p. 183; Flückiger, in Pharm. Journ., vol. x, ser. 2, p. 208; O. Hesse, in Year Book of Pharmacy, for 1872, p. 228, from Journ. Chem. Soc., ser. 2, vol. ix, p. 1064; Ludwig, in Year Book of Pharmacy for 1874, p. 201, from Archiv der Pharm.; Flückiger, in Pharm. Journ., vol. v, ser. 3, p. 845; Chem. and Drug., Nov., 1874, p. 407.

DESCRIPTION OF PLATE.

Drawn from a specimen sent by Mr. Usher, cultivated at Bodicote, near Banbury, Oxfordshire.

1. Whole plant (about $\frac{1}{6}$ nat. size).
2. A flower.
3. One of the upper leaves.
4. Pistil.
5. A stamen.
6. Stigma.
7. Transverse section of ovary.
8, 9. Seeds.
10. Vertical section of the same.
11. Ripe capsule.

(9, 10 much enlarged.)

D. Blair ad nat. del. et lith.

M. & N. Hanhart imp.

PAPAVER RHOEAS. *Linn.*

N. Ord. PAPAVERACEÆ.
Tribe *Papavereæ*.
Genus **Papaver**, *Linn.*

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19. Papaver Rhœas,* *Linn., Sp. Pl., ed.* i, *p.* 507 (1753).

Red Poppy. Corn Poppy. Corn Rose.

Figures.—Woodville, t. 139; Hayne, vi, t. 38; Steph. & Ch., t. 31; Nees, t. 406; Berg & Sch., t. 15 f; Curt., Fl. Lond., fasc. 3; Syme, E. B., i, t. 58.

Description.—An erect annual, 1—3 feet high, with a slender, more or less branched, round, green, hispid or bristly stem, the bristles stiff, spreading; branches erect. Root vertical, tapering, slightly branched. Root-leaves stalked, obovate-lanceolate in outline, deeply pinnatisect with lanceolate distant segments irregularly cut into ascending lobes tipped with bristles; stem-leaves sessile or amplexicaul, triangular in outline, the segments narrower, bright green, hairy on both sides. Flowers solitary, at the ends of the stem and branches, on long stalks, hispid with stiff spreading hairs; buds obovoid, drooping. Sepals 2, articulating with the receptacle and pushed off the top of the flower by the expanding petals and other organs, pale green, set with spreading bristly hairs. Petals 4, large, thin, satiny, brilliant red, with a dark purple spot at the base, crumpled in the bud; the two outer much wider than long, falling over; the two inner about as broad as long, concave, erect; all early caducous. Stamens numerous, hypogynous; filaments narrow, blackish purple; anthers small, violet. Ovary globular-topshaped, 1-celled, with 10 or more placentæ projecting from the wall nearly to the centre; stigmas about 10—14, sessile on and radiating from the centre of the conical summit of the ovary. Capsule shortly stalked, barely $\frac{1}{2}$ inch long and about $\frac{3}{8}$ inch wide, half-ovoid, truncate, perfectly smooth, faintly ribbed along

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* *Rhœas*, in Greek ῥοίας, the classical name of the plant.

the lines of the dissepiments, pale brown, the flat top projecting eave-like beyond the edge and crenate at the margin, dehiscing by a separation of part of the wall from the top, which remains supported by the dissepiments, between each two of which a square orifice is left. Seeds very numerous, minute, lightly attached all over the parietal placentas, reniform, coat marked with elegant raised reticulations; embryo at base of abundant endosperm.

The form of the leaves is subject to great variation, and there is a form with the hairs of the flower-stalks adpressed instead of spreading. Five or six petals instead of four are not uncommon, and the flower is sometimes white.

Habitat.—Few plants are more familiar than the poppy, which is a common weed in all parts of England, especially in cornfields, but also in waste places, railway banks and recently disturbed ground, being at times exceedingly abundant on light soils. In Scotland it does not reach farther north than Forfar. It is common throughout Europe, except in Scandinavia and North Russia, and extends through Asia Minor to North-West India. Its original home is considered by De Candolle to be Dalmatia, Sicily, the Island of Zante, and the South-East Caucasus.

DC. Syst., ii, p. 76; Syme, E. B., i, p. 87; Hook. f., Stud. Fl., p. 15; Watson, Comp. Cyb. Brit., p. 89; Boiss., Fl. Or., i, p. 113; Hook. f., Fl. Ind., i, p. 117; Lindl., Fl. Med., p. 15.

Official Part and Name.—Rhœados Petala. The fresh petals (B. P.). The petals (*Rhœados Petala*) (I. P.). Not official in the United States Pharmacopœia.

General Characters and Composition.—When fresh, red poppy petals are nearly flat, have a bright scarlet colour, a strong narcotic odour, and a slightly bitter taste; but when dried even with the greatest care, they crumple up, lose their odour, and assume a brownish violet-red colour. The fresh petals are to be preferred for use, and are alone official. The principal constituent of red poppy petals is the colouring matter, of which they contain

about 40 per cent. At present this colouring matter has been but imperfectly examined. Acids diminish its intensity, while alkalies render it nearly black. By this latter character the colouring matter of red poppy petals may be distinguished from that of red cabbage, &c., which becomes green under the same circumstances. According to Leomeier the colouring principles of the petals are two acids, which he has termed *rhœadic* and *papaveric*.

According to Chevalier, the petals contain a trace of morphia, but no other chemist has succeeded in obtaining this substance from them. Attfield especially, who examined them recently, could not find the slightest indication of morphia. The milky juice of the capsules and herb generally, however, yielded Hesse a colourless crystallisable substance, with a weak alkaline reaction, which he termed *rhœadine*. The same substance may be found in the ripe capsules of the opium poppy and even in opium itself.

Medical Properties and Uses.—Red poppy petals have been supposed to have, especially when fresh, very slight narcotic properties, but they are now only employed for their beautiful colour, which they readily communicate to water.

The milky juice of the capsules and herb has, however, a manifestly sedative action, which is probably due to *rhœadine*.

Per. Mat. Med., by B. & R., p. 939; Pharmacographia, p. 37; U. S. Disp., by W. & B., p. 739; Ph. Jl., vol. iv, 3 ser., p. 290; Journ. de Pharm., ii, 513.

DESCRIPTION OF PLATE.

Drawn from a specimen collected at Leatherhead, Surrey.

1. Transverse section of ovary.
2. Capsule (drawn somewhat too long).
3. Seed.
4. Section of the same.

(3 and 4 greatly magnified.)

M&N Hanhart imp

SANGUINARIA CANADENSIS L.

N. Ord. Papaveraceæ.

Tribe *Papavereæ*.

Genus **Sanguinaria**, *Linn.** B. & H. Gen., i, p. 53; Baill., Hist. Pl., iii, p. 112. The only species.

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20. Sanguinaria canadensis, *Linn., Sp. Plant., ed.* i, *p.* 505 (1753).

Blood-root. Red-root. Puccoon. Indian Paint.

Figures.—Barton, t. 2; Bigelow, t. 7; Nees, t. 407; Bot. Mag., t. 162; A. Gray, Ill. Gen., t. 49; Baill., l. c., f. 128-9.

Description.—An herbaceous perennial with a horizontal subterranean root-stock, giving off fibrous roots below, and terminating in a bud, which expands into an erect scape surrounded by one, or more rarely two, leaves, with several sheathing scales externally. Rhizome about the size of a finger, cylindrical, fleshy, coppery-red externally, brilliant red when cut, and filled with a copious orange-red juice. Leaves on long, thick, orange-coloured petioles, at first wrapped round the flower bud, and not growing to their full size till after the flower has fallen; then reniform, 5 inches wide, on petioles more than a foot long, palmately 5—9 veined, and deeply cut into 5—9 rounded, cut, and lobed segments, glabrous, pale green above, bluish-white beneath, veins orange. Flower-stalk slender, upright, tapering, 4—6 inches high, longer than the young leaf, cylindrical, terminated by a single large erect flower. Sepals 2, ovate, very fugacious. Petals varying in number from 7—14, usually 8, oval or oblong, variable in width, blunt, about an inch long, spreading, quickly falling, white or faintly tinged with rose, imbricate in two or three rows. Stamens about 24, hypogynous, in several rows, much shorter than the petals; anthers narrow, dehiscing longitudinally. Ovary linear-oblong, 1-celled; placentas 2, parietal; ovules numerous, anatropous, horizontal; style short; stigma 2-lobed.

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* Named from the blood-red juice of the root.

Capsule soft, oblong, pointed at both ends and tipped by the style, 1-celled, 2-valved. Seeds numerous, roundish, smooth, with a prominent crest along the raphe; embryo minute in the base of the fleshy endosperm.

Habitat.—The plant is confined to North America, where it has a wide distribution throughout Canada and the United States, growing on hill-sides and at the borders of woods on a rich soil, and flowering in the early spring before the leaves have expanded. It does well in English gardens, and has been cultivated since before 1680. Dillenius, in his 'Hortus Elthamensis' (t. 252), has figured it with double flowers.

DC. Syst., i, p. 89, and Prod., i, p. 121; Hook., Fl. Bor. Am., i, p. 34; A. Gray, Man. Bot. U. S., p. 60; Chapman, Fl. South States, p. 22; Lindl., Fl. Med., p. 16.

Official Part and Name.—Sanguinaria. The rhizome (U. S. P.). Not official in the British Pharmacopœia, or the Pharmacopœia of India.

General Characters and Composition.—This substance is commonly called *Blood-root* from its red colour. As seen in commerce in a dried state, sanguinaria is in pieces from one to two or three inches in length, and from a quarter to half an inch or more in thickness; it is flattened, wrinkled, twisted, more or less contracted, frequently presenting abrupt branches or offsets, and sometimes with, and at other times without, slender red rootlets. Its colour is dark reddish-brown externally, and it breaks with a short somewhat uneven waxy fracture, the surface of which at first presents a bright orange-red colour, but by exposure it becomes ultimately dull brown. The colour of the powder is greyish orange-red. Sanguinaria has a faint narcotic odour, which is more perceptible when fresh, and a bitter, persistently acrid taste.

Sanguinaria is supposed to owe its acrimony and medical properties to a peculiar alkaloid termed *sanguinarina*, which was first isolated by Dr. Dana, of New York. This is said to be identical with *chelerythrin*, the alkaloid of Celandine (*Chelidonium*

majus). Its salts are all soluble in water and form beautiful red solutions. Three other principles have been noticed as constituents of sanguinaria, one of which is regarded by Riegel, its discoverer, as analogous to the *porphyroxin* of opium, but this is denied by Gibb ; the second has been termed *puccin ;* and the third *sanguinarinic acid.* Sanguinaria is said to deteriorate rapidly by keeping.

Medical Properties and Uses. — Sanguinaria is emetic and purgative in large doses ; and stimulant, diaphoretic, and expectorant in small doses. It is also said to act as an emmenagogue ; and Eberle states that it exercises a sedative influence on the heart as certain as that of digitalis. In excessive quantities it acts as an acro-narcotic poison. When applied externally it is reputed to have well-marked escharotic properties, and Dr. Fell, of the United States, strongly recommends a mixture of it and chloride of zinc made into a paste with flour and water, as an external application for the destruction of cancerous growths ; but from trials made with it at the Middlesex Hospital and elsewhere in this country it would appear that, if it produces any effect in such cases it must be very small indeed, and that it is, therefore, practically useless for such a purpose. Sanguinaria might probably be useful as a dyeing agent.

U. S. Disp., by W. & B., p. 769; Ph. Jl., vol. xvii, p. 312, vol. i, 2nd ser., p. 454, and vol. iv, 2nd ser., p. 263; Per. Mat. Med., vol. ii, part 2, p. 660.

DESCRIPTION OF PLATE.

Drawn from a specimen grown in the Royal Gardens, Kew, flowering in April; the fruit and seed added from A. Gray.

1. A bud, showing the sepals.
2. Vertical section of ovary showing insertion of stamens.
3. Transverse section of ovary.
4. Fruit.
5. Seed.
6. Transverse section of the same.

(2, 3 enlarged; 5, 6 much magnified.)

D.Blair ad nat del. et lith.

M & N Hanhart imp.

COCHLEARIA ARMORACIA, *Linn.*

N. Ord. Cruciferæ. Lindl., Veg. K., p. 351 (*Brassicaceæ*); Le Maout & Dec., p. 221; Baill., Hist. Pl., iii.

Tribe *Alyssineæ*.

Genus Cochlearia,* *Linn.* B. & H., Gen., i, p. 75; Baill., Hist. Pl., iii, p. 270. Species about 30, natives chiefly of the colder parts of the northern hemisphere.

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21. Cochlearia Armoracia,† *Linn., Sp. Plant., ed.* 1, *p.* 648 (1753)

Horse-Radish.

Syn. — Cochlearia rusticana, *Lam.* Armoracia rusticana, *Baumg.* Roripa rusticana, *Gr. & Godr.*

Figures.—Woodville, t. 145; Hayne, v, t. 29; Steph. & Ch., t. 114; Nees, t. 400; Syme, E., Bot., i, t. 129; Reichenb., Ic. Fl. Germ., ii, t. 17.

Description.—A large herbaceous perennial with a short thick rootstock scarred by the fallen leaves, and a very long thick cylindrical root often more than an inch in diameter, nearly smooth, pale brownish-yellow externally, white or very pale yellow within, giving off thick horizontal branches at some distance below the surface of the ground which send up vertical stolons producing at their extremities new plants. Root-leaves very large, the blade reaching a foot long and the petiole of equal or greater length, oval- or ovate-oblong, usually subcordate and unequal at the base, obtuse at the apex, coarsely and irregularly crenate, thick, strongly veined, dark green. Stems 2 or 3 feet high, erect, stiff, smooth, striate, hollow, much branched in the upper part, branches weak, slender, ascending. Stem-leaves nearly or quite sessile, narrowly oval or strap-shaped, blunt, tapering below, serrate, smooth. Flowers numerous, $\frac{3}{8}$ inch wide, on long stalks arranged in numerous small axillary and terminal corymbs

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* *Cochlearia*, a mediæval name for the Scurvy-grass (*C. officinalis*), from the shape of the root-leaves, like a spoon, *cochlear*.

† *Armoracia*, the classical name; but it cannot be with certainty referred to the present plant, and may have been the name of the true Radish, *Raphanus sativus*, L.

lengthening out into racemes, the whole forming a large lax somewhat flat-topped inflorescence; no bracts. Sepals 4, equal, oval, smooth, blunt, somewhat spreading, purplish. Petals 4, alternate with the sepals and about twice their length, obovate-oblong, entire, usually with a short claw, white. Stamens 6, tetradynamous, filaments about as long as the sepals, anthers yellow. Ovary oblong, 2-celled, style short, stigma large capitate. Fruit (unripe) a small silicle about $\frac{1}{6}$ inch long, obovoid, somewhat inflated, pericarp thin, faintly veined, dehiscing into 2 boat-shaped valves without dorsal nerves. Seeds (not seen fully developed) several in each cell ovoid, smooth; cotyledons accumbent; no endosperm.

Habitat.—This large and coarse-looking plant is common enough in damp waste ground, river-banks and similar localities throughout this country and the whole of Europe except the most southern parts. It is, however, probably an introduced plant here and in Western Europe generally, its native country being found in Russia; though it can scarcely be said to be met with anywhere truly wild. Dr. Hooker suggests that it may be a cultivated form of the Hungarian *C. macrocarpa*, W. & K. It flowers in May and June. The seeds are very rarely perfected, though the pods sometimes grow apparently to their full size; but the plant is wonderfully persistent from the power which its long branching roots possess of producing adventitious buds, thus rendering it very difficult to extirpate. The root-leaves are frequently found deeply cut in a pinnatisect or bipinnatisect manner with oblong segments.

Hook, f., Stud. Fl., p. 34; Syme, E., Bot., i, p. 183; A. De Candolle, in Bot. Gazette, 1851, p. 141; Ledebour, Fl. Ross., i, p. 159; Lindl., Fl. Med., p. 91.

Official Part and Name.—Armoraciæ Radix; the fresh root (B. P.). The fresh roots (*Armoraciæ Radix, Horseradish Root*) (I. P.) It is not official in the Pharmacopœia of the United States.

General Characters and Composition.—Fresh horseradish root

is a foot or more in length; it is provided with a few irregularly arranged more or less thickened branches, and is either undivided above, or it divides into two or more divisions, from which the leaves, &c., arise. In diameter it varies from ½ an inch to 2 inches or more; but as commonly used it is about the thickness of the thumb or middle finger. In form it is enlarged at the crown, or point where the leaves are given off; it then slightly tapers, but soon becomes more or less cylindrical, and frequently maintains nearly the same thickness for some distance, and then commonly divides into two or more branches, or in some cases, very gradually tapers downwards. In colour externally it is pale yellowish- or brownish-whitish; and whitish and fleshy within. Its odour, when scraped or bruised, is highly pungent, frequently causing sneezing and a flow of tears; but when unbroken, it is almost inodorous. It has a very pungent taste, more especially in spring and autumn, accompanied by a bitterish or sweetish flavour according to the season in which it is collected, the manner in which it is cultivated, and the soil in which it is grown. If carefully dried its pungent taste is to a great extent retained; but it is gradually lost if the root be long kept.

We have given the above characters somewhat in detail in consequence of the deaths that have occurred from the poisonous Monkshood or Aconite root having been scraped and served up at table in the winter and early spring months in mistake for horseradish root. In a paper published by one of us in the *Pharmaceutical Journal* some years since, the distinctive characters of the two roots were tabulated as follows :—

Horseradish root.	*Aconite root.*
Form.—Slightly conical at the crown; then cylindrical or nearly so, and almost of the same thickness for many inches.	*Form.*—Conical, and tapering perceptibly and rapidly to a fine point.

Colour.—Pale yellowish- or brownish-white externally.	*Colour.*—Coffee-coloured, or more or less distinctly earthy-brown externally.
Odour.—Especially developed upon being scraped, when it is very pungent and irritating.	*Odour.*—Merely earthy.
Taste.—Very pungent, and bitter or sweet according to circumstances.	*Taste.*—At first slightly bitter, but afterwards producing a disagreeable tingling and numbness.

Since the publication of the above paper, and the marked attention which was called to this highly dangerous substitution, no further accidents have taken place; it is hoped, therefore, that now the great differences between the two roots have been pointed out it will not again occur.

The chemistry of horseradish root has not as yet been accurately determined. It is certain, however, that it owes its properties essentially to the formation of a *volatile oil* which may be obtained from it by distillation with water. This oil was proved by Hubatka, as far back as 1843, to be identical with the volatile oil obtained under like circumstances from black mustard seeds. The volatile oil does not therefore pre-exist in horseradish root, but is developed like that of black mustard from the mutual reaction of sinigrin and myrosin in the presence of water, as described under *Brassica* (*Sinapis*) *nigra*. This process, according to the authors of *Pharmacographia*, "does not go on in the growing root, perhaps because the two principles in question are not contained in the same cells, or else exist together in some condition that does not allow of their acting on each other,—a state of things analogous to that occurring in the leaves of *Lauro-cerasus*." It should, however, be noted that the presence of myrosin is inferred to be one of the constituents of horseradish root, rather than proved. The amount of volatile oil thus obtained by the distillation of fresh horseradish root with water is very small, averaging only about 0·2 per cent.

Medical Properties and Uses.—It has the same properties as

mustard, being stimulant, diuretic, and diaphoretic, when given internally; and rubefacient or even vesicant, when externally applied. When chewed it acts as a sialagogue; and when used in this way, or in the form of a syrup, slowly swallowed, it has been found useful in cases of hoarseness. As a general stimulant, diaphoretic, and diuretic, it has been employed in chronic rheumatism, scurvy, atonic dyspepsia, and dropsy. In the form of the official compound spirit of horseradish it is commonly used as a stimulating adjunct to other medicines, more especially to diuretic infusions. An infusion of horseradish has also been employed to excite vomiting; or to promote the operation of other emetics, as in poisoning by narcotic substances. Externally applied, it has been found useful in chronic rheumatism, paralysis, and other affections. As a medicine, however, it is but little employed; its chief use being as a condiment, and when partaken of in moderation, it increases the appetite, and promotes digestion. Its employment as a condiment in Northern and Central Europe has been known for centuries. Thus Gerarde, at about the end of the sixteenth century, speaks of its common use "among the Germanes to eat fish with, and such like meats, as we do mustard;" but it was not till about the middle of the seventeenth century that it began to be employed for similar purposes in this country.

Per. Mat. Med., by B. & R., p. 933; Pharmacographia, p. 66; Gerarde's Herball., by Johnson (1636), p. 240; U. S. Disp., by W. & B., p. 146; Hubatka, in Journ. de Pharm., 3rd ser., vol. xlii; Bentley, in Pharm. Journ., vol. xv, 1st ser., p. 449.

DESCRIPTION OF PLATE.

Drawn from a specimen collected by the Thames, near Kew Bridge, Surrey, flowering in June; the root from a plant in Kew Gardens; the fruit (not mature) from a Spanish specimen in the British Museum. 1. The inflorescence and upper part of flowering stem. 2. A flower. 3. Stamens and pistil. 4. A sepal. 5. A petal. 6. Immature fruit, natural size and enlarged. 7. A root-leaf. 8. Portion of the root. (2–5 enlarged.)

W & N Hanhart imp.

BRASSICA NIGRA *Koch*

N. Ord. Cruciferæ.

Tribe *Brassiceæ*.

Genus **Brassica**, *Linn.** B. & H., Gen. i, p. 84; Baillon, Hist., iii, p. 185. Species variously estimated, 80 to 150, natives of the temperate regions of the Old World. Includes *Sinapis*, *Erucastrum*, &c.

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22. Brassica (*Sinapis*†) nigra, *Koch, in Röhling, Deutschl. Flora*, iv, *p.* 713 (1833).

Black, Brown, or Red Mustard.

Syn.—Sinapis nigra, *Linn., and many authors.* Brassica sinapioides, *Roth.* Melanosinapis communis, *Spenn.*

Figures.—Woodville, t. 146; Steph. & Ch., t. 42; Hayne, viii, t. 40; Nees, t. 403; Berg, Charact., t. 84, f. 605; Berg and Sch., t. 30 e; Syme, E. B., i, t. 85.

Description.—A large branching annual, often four feet high, stem and spreading branches stiff, dark green, more or less hispid below, usually glabrous above. Lowest leaves lyrate, slightly hispid, with a large terminal segment, intermediate ones irregularly pinnatifid, upper ones lanceolate, all stalked, dark green, margin (except of the uppermost ones) faintly serrate. Flowers in corymbose racemes, stalked, small (not $\frac{1}{4}$ inch in diameter), ebracteate, pedicels shorter than calyx. Sepals 4, narrowly oblong, pale green, spreading almost horizontally. Petals 4, alternating with sepals, with a narrow claw and roundish blade, bright yellow, spreading. Stamens 6, hypogynous, tetradynamous, the two with short filaments lateral, inserted lower than the others, with a small gland placed above the base of each, the four with longer filaments placed in pairs antero-posteriorly, with a large gland at the base of each pair; anthers versatile. Pistil oblong-ovoid, tapering into a short style; stigma capitate, bilobed; ovary 1-celled, with two parietal placentæ; ovules several. Fruit a siliqua, about $\frac{3}{4}$ inch long,

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* *Brassica*, the Latin name for a cabbage.

† *Sinapis*, Greek σίναπι or νᾶπυ, mustard.

oblong-linear, erect or adpressed to the axis of the raceme, somewhat quadrangular, glabrous, tipped with a short tapering beak, dehiscent by two valves, each of which is keeled by a single dorsal vein, 2-celled, with 3—7 seeds in a single row in each cell, and none in the beak. Seeds roundish-oval, about $\frac{1}{25}$ inch in diameter; testa dark, brownish-red, minutely pitted to the naked eye; embryo large, the cotyledons conduplicate, the outer one larger and enclosing the inner, which is folded round the bent-up radicle; endosperm none.

Habitat.—Black mustard is a weed in waste and cultivated ground throughout England and the South of Scotland, but is perhaps doubtfully native here. It grows throughout Europe, except the extreme north-east parts, Asia Minor, North-West India, South Siberia, and North Africa, and has become naturalised in North and South America. It is cultivated in England in Lincolnshire and Yorkshire, and in parts of Germany Holland, and Italy.

The genus *Sinapis* cannot be kept separate from *Brassica* by any satisfactory characters.

DC. Syst., ii, p. 608; Syme, E. B., i, p. 126; Hook. f., Stud. Fl., p. 30; Watson, Comp. Cyb. Br., p. 104; Gr. & Godr., Fl. France, i, p. 77; Hook. f., Fl. Ind., i, p. 156; Lindl., Fl. Med., p. 92.

Official Parts and Names.—1. SINAPIS; the seeds of Sinapis nigra, *Linn.*, and Sinapis alba, *Linn.*, reduced to powder, mixed: 2. OLEUM SINAPIS; the oil distilled with water from the seeds of Black Mustard, Sinapis nigra, *Linn.*, after the expression of the fixed oil (B. P.). A mixture of the seeds of both the above species reduced to powder (*Sinapis, Mustard*) (I. P.). SINAPIS NIGRA; the seeds of Sinapis nigra (U. S. P.).

1. SINAPIS.—Mustard being a mixture of the powdered seeds of both Sinapis nigra, *Black Mustard,* and Sinapis alba, *White Mustard,* we shall reserve our notice of this substance until we have described separately the characters of the two kinds of seeds of which it is composed. (See *Sinapis,* under *Sinapis alba.*)

General Characters and Composition of Black Mustard Seeds.—Black mustard seeds, or as they are also sometimes termed *Brown*

and *Red mustard seeds*, are very small, and roundish in form. Externally they have a deep reddish-brown colour, or sometimes greyish, the surface being reticulated with minute pits; internally they are yellow. Their powder has a greenish-yellow colour. In the entire state they are inodorous, and even when powdered dry; but when the seeds are triturated with water they exhale a strong pungent odour so as to affect the eyes, and in some cases even to cause a flow of tears. When masticated their taste is at first bitterish, which is immediately followed by pungency.

Black mustard seeds yield by expression an inodorous, non-drying *fixed oil*, with a mild oily taste. The amount of oil thus obtainable by pressure averages 25 per cent. The seeds also contain a crystalline substance, commonly known under the name of *myronate of potash*, but better characterised as *sinigrin*; and an albuminous body closely resembling the emulsin of almonds, and termed *myrosin*. Sinigrin, as shown by Will and Korner, is a compound of *Sulphocyanide of Allyl*, *Bisulphate of Potassium*, and *Sugar*. There is no starch in the ripe seeds. The pungent principle upon which the properties of black mustard seeds essentially depend does not pre-exist in the seeds, but is obtained in the form of a volatile oil when the macerated seeds are distilled with water (see *Oleum Sinapis*). The fact that the pungent volatile oil does not pre-exist in the seeds explains their want of odour in a dried state.

2. Oleum Sinapis.—The volatile or essential oil of mustard, which is official under the name of *oil of mustard*, does not pre-exist in black mustard seeds, as just stated, but is produced whenever water is added to the powdered seeds by the action of myrosin on the sinigrin, just as the volatile oil of almonds (see *Oleum Amygdalæ Amaræ*) is formed under the same circumstances by the action of emulsin on amygdalin. The temperature of the water used should not exceed 122° Fahr., as a much higher degree of heat prevents altogether the formation of the oil. It is to this oil that the pungent smell and taste of black mustard, as well as its inflammatory action on the skin, is due. Oil of mustard is colourless or pale yellow, of an exceedingly pungent odour, and a most acrid and pungent taste.

It boils at about 298° Fahr., and has a specific gravity of 1·015 at 68° Fahr. It is readily soluble in alcohol and ether, but only very slightly so in water. It contains sulphur as one of its constituents, and is regarded by chemists as a *sulphocyanide of allyl.*

Medical Properties and Uses.—Black mustard seed is a powerful stimulant. It is rarely employed in a pure state, but usually in the form of Flour of Mustard, which, as commonly prepared for the table, is a mixture of both black and white mustard seeds. This is also the composition of the official mustard of the British Pharmacopœia. Pure flour of black mustard may, however, be obtained from the manufacturers. The properties and uses of mustard are more fully described under the head of *Sinapis* in *Sinapis alba.* Mustard paper (*Charta Sinapis*), has been recently introduced into the appendix of the British Pharmacopœia and into the United States Pharmacopœia. It is prepared by coating the surface of cartridge-paper with a mixture formed by adding Black Mustard seeds in powder to a solution of gutta percha. It is an imitation of Rigollot's mustard leaves which have been extensively used for some years as a ready, simple, cleanly, and safe rubefacient.

The oil of mustard when applied to the skin in its pure state produces almost instant vesication ; but when dissolved in rectified spirit, or spirit of camphor, or employed in the form of the Compound Liniment of Mustard of the British Pharmacopœia, it is a very useful application for chilblains, chronic rheumatism, &c. When this liniment is slightly sprinkled on impermeable piline, and applied to the skin, it also forms an elegant substitute for a mustard poultice.

Per. Mat. Med., by B. & R., p. 935 and 1076; Pharmacographia, p. 62; U. S. Disp., by W. & B., p. 809; Garr., Mat. Med., p. 208.

DESCRIPTION OF PLATE.

Chiefly drawn from a specimen collected at Warnham, Sussex. 1. Portion of the flowering plant. 2. A diagram of the flower. 3. The andrœcium and pistil. 4 and 5. Ripe fruit. 6. The same, with one valve removed. 7. A seed. 8. Section of the same. 9. The embryo. (5—9 enlarged.)

M. & N. Hanhart

BRASSICA ALBA, Boiss.

N. Ord. CRUCIFERÆ.
Tribe *Brassiceæ*.
Genus Brassica, *Linn.*

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23. Brassica (*Sinapis*) alba, *Hook. f. & T., in Hook. f., Fl. Brit. Ind., i, p.* 157 (1872).

White Mustard.

Syn.—Sinapis alba, *Linn., and most authors.* Leucosinapis alba, *Spach.*

Figures.—Steph. & Ch., t. 42; Nees, t. 402; Hayne, viii, t. 39; Berg, Charact., t. 85, f. 606; Curt., Fl. Lond., fasc. 5; Syme, E. B., i, t. 84.

Description.—An erect annual, usually about 2 feet high, with a few ascending branches, stiff, bright green, bristly, with reflexed hairs throughout. Leaves all stalked, pinnatifid, the lowest ones with the terminal lobe large, and the divisions reaching to the midrib, uppermost ones less deeply cut, rough with hairs. Flowers as in *B. nigra*, but twice as large, and pedicels considerably longer; petals much paler yellow; pistil hairy below, a little longer than the stamens. Siliquas 1—1½ inches long, on divaricate stalks, spreading, the lower half beaded with the 4—6 contained seeds, the upper half occupied by a flat, vertical, nearly smooth beak, curved upwards, which often has a seed contained in its base, valves short, with 3 prominent veins, strongly bristly. Seeds subglobular, about $\frac{1}{10}$ inch in diameter, pale yellow; testa smooth to the naked eye; embryo as in *B. nigra*, green.

Habitat.—White mustard is readily distinguished from black by its smaller size, much larger flowers and seeds, and spreading hispid pods with a long falcate beak. Like the latter plant it is a frequent weed in England, but is more restricted to cultivated ground, being especially a cornfield plant in calcareous districts; and has perhaps still less claim to be considered a British plant. It occurs throughout Europe, especially in the south, where it is probably native, and in Asia Minor, Algeria, and China, and is cultivated in England (Essex and Cambridgeshire) and in the

United States, where it has escaped and occurs as an occasional weed.

DC. Syst., ii, p. 620; Syme, E. B., i, p. 125; Hook. f., Stud. Fl., p. 30; Watson, Comp. Cyb. Br., p. 104; Hook. f., Fl. India, i, p. 157; Gren. & Godr., Fl. France, i, p. 74; Lindl., Fl. Med., p. 92.

Official Parts and Names.—SINAPIS; the seeds of Sinapis nigra, *Linn.*, and Sinapis alba, *Linn.*, reduced to powder, mixed (B. P.). A mixture of the seeds of both the above species reduced to powder (*Sinapis, Mustard*) (I. P.). SINAPIS ALBA; the seed of Sinapis alba (U. S. P.).

SINAPIS ALBA.—White mustard seeds are much larger than those of black mustard seeds. They are roundish in form, of a yellow colour, and very finely pitted in a reticulate manner on their surface; internally they are bright yellow. They are inodorous when entire, and almost entirely so even when triturated with water, as no volatile principle is then formed as with black mustard seeds under the same circumstances. Their taste is similar to, but less pungent than, black mustard seeds.

White mustard seeds yield by expression a similar *fixed oil* to that obtained from black mustard seeds. They also contain *myrosin*, but no *myronate of potash* or *sinigrin*, and hence no volatile oil can be obtained from them by distillation. From the investigations of Will it would appear that white mustard seeds owe their peculiarity to the presence of a crystalline principle, called *Sinalbin* or *sulpho-sinapisin*, which is a compound of three bodies, namely, *Sulphocyanate of Acrinyl, Sulphate of Sinapin*, and *Sugar*. When sinalbin is placed in contact with water and myrosin at ordinary temperatures it is resolved into its three constituent substances; but the sulphocyanate of acrinyl, which is the active principle of white mustard seeds, does not pre-exist in the seeds, and cannot be obtained from them by distillation. It is owing to the presence of sulphocyanic acid that the infusion of white mustard seeds becomes of a bright red colour when a persalt of iron is added to it. An infusion of black mustard seeds under the same circumstances only assumes an orange tint.

Medical Properties and Uses.—Similar to, but milder than, those of black mustard seeds. When swallowed whole they

operate as a laxative, and have been used as a remedy in dyspepsia, and in other complaints attended with torpidity of the bowels. But their use in this state is by no means free from danger, as they sometimes accumulate in the intestines, and have produced fatal effects. They are chiefly used when mixed with black mustard seeds in the form of the official mustard (*Sinapis*), which see.

The seed-leaves of *Sinapis alba* and of *Lepidium sativum* are used as a salad under the name of *mustard and cress.*

Sinapis.—*Flour of mustard,* or as it is commonly termed *mustard,* was formerly supposed to be prepared solely from black mustard seeds, but whatever may have been the case, the ordinary commercial mustard is now always manufactured from a mixture in varying proportions of both black and white mustard seeds. This mixture, as we have seen, also constitutes the official mustard of the British Pharmacopœia.

Manufacture.—The following method of preparing mustard was furnished to Dr. Pereira by a manufacturer :—The seeds of black and white mustard are first crushed between rollers, and afterwards pounded in mortars. The pounded seeds are then sifted. The residue in the sieve is called *dressings* or *siftings ;* what passes through is *impure flour of mustard.* The latter by a second sifting yields *pure flour of mustard,* and a second quantity of dressings.

General Characters.—The characters of mustard as given in the British Pharmacopœia are as follows :—" Greenish-yellow, of an acrid bitterish oily pungent taste, scentless when dry, but exhaling when moist a pungent penetrating peculiar odour, very irritating to the nostrils and eyes. A decoction cooled is not made blue by tincture of iodine." The latter test is added for the purpose of detecting flour or starch, as the mustard of commerce is frequently adulterated with these substances, which are coloured by turmeric, and rendered hot by capsicum. The chemical characters of mustard and the sources of its active properties have been already referred to when treating separately of the chemical composition of black and white mustard seeds.

Medical Properties and Uses.—The properties and uses of both black and white mustard seeds have been already treated of

separately, but we have now to describe those of mustard generally. Mustard acts as a powerful stimulant, holding, according to Pereira, an intermediate rank between horseradish and pepper. Externally applied it is a most valuable rubefacient, and if kept long in contact with the skin it causes vesication; but its use requires caution, as its too lengthened application may occasion ulceration and even gangrene.

Mustard is used in medicine for several purposes. As an emetic mustard is especially valuable when there is great torpor of the stomach, and in other cases where it is desirable to empty that organ without producing a depressing influence in the system, as in narcotic poisoning, and some forms of paralysis, &c. It has also been employed as a diuretic in dropsies, and in other ways; but the principal use of mustard is as a rubefacient, and in the form of a mustard poultice its application is useful to relieve slight inflammation of serous and mucous surfaces when applied to a neighbouring part; as for example, upon the chest in bronchitis and pleurisy; also to relieve congestion of various organs by drawing blood to the surface, as in head affections; and likewise for the alleviation of neuralgic and other pains and spasms. Mustard is also frequently added to local baths, as for the feet. (See also *Oleum Sinapis.*)

Besides its use in medicine mustard is very largely employed as a condiment, and when taken in moderate quantities with the food, it promotes the appetite, and assists the assimilation of substances which are difficult of digestion.

Per. Mat. Med., vol. ii, part ii, p. 582; U. S. Disp., by W. & B., p. 810; Per. Mat. Med., by B. & R., p. 937; Pharmacographia, p. 65; Garr., Mat. Med., p. 209; Greenish, in Pharm. Journ., vol. 3, ser. 3, p. 782, and vol. 4, p. 381.

DESCRIPTION OF PLATE.

Made from a specimen collected at Box Hill, Surrey. 1. The andrœcium and pistil. 2. A ripe fruit. 3. Horizontal section of the same. 4. A seed. 5 Section of the same. 6. The embryo. (1, 4, 5, 6 enlarged.)

D.Blair ad nat del et lith

CISTUS CRETICUS, *Linn*

M&N.Hanhart imp

N. Ord. CISTACEÆ. Lindl., Veg. K., p. 349; Le Maout & Dec., p. 238; Baill., Hist. Pl., iv.

Genus Cistus,* *Linn.* B. & H., Gen., i, p. 112; Baill., iv, p. 323. Species 20 or more, natives of S. Europe and the countries round the Mediterranean.

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24. Cistus creticus, *Linn., Syst. Nat., ed.* 10, *p.* 1077 (1759).

Ladano (Crete).

Syn.—C. vulgaris, var., *Spach.* C. villosus, var., *Boiss.*

Figures.—Woodville, t. 207?; Nees, t. 432; Fl. Græca, t. 495, cop. in Hayne, xiii, t. 33; Jacquin, Ic. Rar., i, t. 95; Reichenb., Ic. Fl. Germ., iii, t. 40; Willkomm, Mon. Cistin., t. 83.

Description.—A small bush with numerous spreading opposite terete branches, with a rough grey bark, the younger twigs densely covered with tufts of shortish white hairs. Leaves ½—1½ ins. long, opposite, readily falling, sessile, obovate-spathulate, acute or obtuse, tapering into the broad attenuated almost sheathing base, entire, bright green, shortly glandular and hairy in tufts on both sides, with prominent reticulate veins beneath, thick, wavy and crisped, the upper ones narrower. Flowers abundantly produced in small cymes at the extremities of the branches, 1½ inches wide, stalked. Sepals 5, leafy, very broadly ovate, suddenly narrowed to an acute apex, strongly veined, hairy like the leaves, and also with long hairs on the back, margins membranous, imbricate in the bud. Petals 5, roundish, imbricate, much crumpled in the bud, delicate, of a deep clear bluish-pink with a yellow base, soon falling. Stamens indefinite, hypogynous, inserted in several rows on the receptacle, with which they are articulated leaving circular scars after their fall, filaments orange coloured; anthers small, darker. Ovary shorter than the stamens, ovoid, densely covered with long white silky hairs, 1-celled (partially 5-celled), with 5 parietal placentas extending nearly or quite to the centre (where they are actually combined

* *Cistus*, in Greek κίστος or κίσθος, the classical name.

below), and then revolute on both sides towards the wall; ovules numerous, attached in two rows by long funicles to the revolute margins of the dissepiments; style simple, as long as the ovary; stigma capitate. Fruit a small capsule, $\frac{3}{8}$ inch long, ovate, acute, brown, hairy, furrowed, splitting loculicidally into 5 valves. Seeds numerous, with long funicles, orange-yellow, smooth or reticulate, roundish, flattened; embryo long, slender, curled up in the centre of the endosperm.

Habitat.—The Ladanum or Labdanum bush is a native of rocky ground in Macedonia, Thrace, Greece, and the islands of Crete, Rhodes, Sicily and Cyprus, in some of which it is very abundant. Boissier considers it a variety of the variable *C. villosus*, L., which is spread over the Mediterranean district from Italy to Palestine, and occurs also in Corsica and N. Africa. The leaves of the plant are exceedingly viscid; the glandular structure of the short hairs is figured in Unger and Kotschy's work on Cyprus quoted below (p. 403). It was in cultivation in England in 1731, and its delicate flowers may now be seen in most of our botanic gardens in June and July.

DC. Prod., i, p. 264; Boiss., Fl. Orient., i, p. 437; Unger and Kotschy, Die Insel Cypern (1865), pp. 336 & 393–410; Lindl., Fl. Med., p. 131.

Part Used and Name.—Labdanum, *Ladanum;* a viscid resinous exudation from the leaves and branches of various species of Cistus, more especially of C. creticus, *L.*, but also of C. ladaniferus, *L.*, C. laurifolius, *L.*, and C. salvifolius, *L.* It is not now official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United States. But it was formerly official in the London and other British Pharmacopœias, and in the United States Pharmacopœia.

Collection and Commerce.—Labdanum is collected in both Crete and Cyprus; that of the former island being known as Candian Labdanum, and that of the latter as Cyprian Labdanum. In Crete it is collected from about the middle of May to the middle of July, or during the hottest season, when the plants are very

glutinous from being covered with this resinous exudation. The collectors are called *Labdanists ;* and for its collection they use a peculiar wooden instrument, which is termed an *ergastiri* or *lambadistrion ;* this is a kind of rake, to which a double row of leathern thongs are fixed instead of teeth, and with which the leaves of the shrubs are lightly brushed backwards and forwards, so that the viscid resinous exudation may adhere to the pieces of leather, from which it is afterwards scraped off with knives, and subsequently kneaded and moulded into different forms. In Cyprus labdanum is collected by the shepherds by combing the resin from the fleeces of the sheep, which become loaded with it while they are pasturing. This is then purified by fusion in pots of wood or clay, and afterwards moulded into its various forms. It is stated that about 6000 lbs. are annually sent from Crete to Turkey, and that the yearly produce of Cyprus varies from about 2500 to 2800 lbs. Some Labdanum is also said to be collected in Spain and Portugal, but it is not an article of commerce.

General Characters, Varieties, and Composition. — There are two forms of Cyprian labdanum, namely, in sticks (*Labdanum in bacculis*), and in irregular masses (*Labdanum in massis*). In Crete the best labdanum is considered to be that which is moulded into contorted or spiral pieces (*Labdanum in tortis*), but Cyprian labdanum is preferred at Constantinople to the best from Crete. The purest labdanum has a dark reddish or almost black colour externally, and internally it is greyish. It readily softens by the heat of the hand, and is easily fused into a transparent liquid. Its odour is agreeable and balsamic, and its taste balsamic, bitterish, and slightly acrid. It is very inflammable, and burns with a clear flame. Labdanum is commonly very largely contaminated with sand and other earthy matters, sometimes to the extent of above 70 per cent. Guibourt found in pure labdanum 86 per cent. of *resin*, a little *volatile oil*, 7 per cent. of *wax*, and other unimportant constituents.

Medical Properties and Uses.—Labdanum possesses stimulant and expectorant properties, and was formerly much employed in catarrhal affections, dysentery, and several other diseases ; but its

use in such cases is now obsolete. It was formerly official in our pharmacopœias, and entered as a constituent into some plasters, but it is rarely or ever used, even as an external application, at the present day, either in this country or the United States of America. Frictions with an oily solution of labdanum are still, however, highly esteemed in Cyprus as a remedy against catarrhal and rheumatic affections. The same solution was formerly regarded by the Turks as a most efficacious preventive against the plague, and for the same purpose it was the common practice to have pieces of labdanum affixed to their walking sticks, or to wear them as amulets.

At the present time labdanum is chiefly used by the Turks for fumigation, and to some extent also as a perfume.

Dioscorides, Mat. Med., lib. i, p. 128; Pliny, Hist. Nat., lib. xii, cap. 17; Belon, Observations de Plusieurs Singularités en Gréce, Asie, &c., lib. i, cap. 7; Tournefort, Voyage du Levant, t. i, p. 29; Lewis, Mat. Med., p. 368; U. S. Disp., by W. and B., p. 1627; Landerer, in Pharm. Journ., vol. x, 1st ser., p. 349, and vol. xi, p. 6.

DESCRIPTION OF PLATE.

Drawn from a plant in the garden of the Apothecaries' Company at Chelsea, flowering in June; the fruit added from Hayne.

1. Branch with flowers and foliage.
2. Pistil and insertion of petal and stamens.
3. Transverse section of ovary.
4. Fruit.
5. The same dehiscing.
6. Section of seed.

(2, 3, 5 enlarged; 6 much magnified.)

D Blair ad viv del et lith

M&N Hanhart imp

VIOLA ODORATA, *L.*

N. Ord. VIOLACEÆ. Lindl., Veg. Kingd., p. 338; Baill., Hist. Pl., iv; Le Maout & Dec., p. 240.

Tribe *Violeæ*.

Genus Viola,* *Linn.* B. & H. Gen., i, p. 117; Baill., l. c., p. 351. Over 200 species are described, principally natives of the temperate northern hemisphere, but some found in S. America, S. Africa, and Australia.

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25. Viola odorata, *Linn., Sp. Plant., ed.* 1, *p.* 934 (1753).

Sweet Violet.

Syn.—V. suavis, *Bieb.* V. imberbis, *Leighton.* V. alba, *Besser.*

Figures.—Woodville, t. 89; Hayne, iii, t. 2; Steph. & Ch., t. 29; Nees, t. 386; Berg & Sch., t. 16 b; Curt., Fl. Londin., fasc. 1; Syme, Eng. Bot., ii, t. 171; Baill., l. c., iv, figs. 363–6.

Description.—A small perennial herb with a short semi-subterranean rather fleshy stem (rootstock), the older part emitting fibrous roots, the upper younger portion still marked with the close circular scars of the leaves of former years, and giving off elongated, rather fleshy, leafless runners which root at the end and thus form independent plants. Leaves crowded on the upper part of the short stem (radical), involute before expansion, on long, cylindrical, very shortly hairy stalks, stipules semi-membranous, lanceolate, acute, with glandular cilia on the edge, blade 1—2 inches long (at the time of flowering), roundish-ovate, deeply cordate at the base, somewhat blunt at the apex, crenate-serrate at the margin, undulated, strongly veined, with very short hairs on the edges and veins, otherwise smooth, dark green. Flowers solitary, $\frac{1}{2}$—$\frac{3}{4}$ inch wide, on long, slender, axillary stalks (scapes) exceeding the leaves, with a pair of small linear-lanceolate bracts about or a little above their middle, and stiffly crooked at the ends so that the flowers nod. Sepals 5, oblong, blunt, slightly hairy on the edges, each produced backwards into a flat, blunt process, persistent. Petals 5, unequal, the odd one inferior, spreading, imbricate, obtuse, bluish-purple, the lowest one largest marked with dark veins and prolonged backwards into a short, blunt, nearly

* *Viola*, in Greek ἴον, the classical name for *V. odorata*, but also applied to a few other plants.

straight spur, the lateral ones with a tuft of hairs near the base. Stamens 5, hypogynous, alternating with the petals, filaments almost absent, anthers large, erect, introrse, 2-celled, dehiscing longitudinally, slightly coherent by their margins, the connective prolonged in all at the top to form a short triangular process, and in the two inferior ones also backwards to form laterally compressed oblong spurs which are received into the hollow spur of the inferior petal. Ovary conical, smooth, shorter than the stamens, 1-celled, with three parietal placentas with numerous ovules in several rows, style longer than the ovary, somewhat thickened upwards, curved downwards at its sharp point. Fruit a subglobose, pubescent, blunt capsule, $\frac{3}{8}$ inch in diameter, dehiscing loculicidally into 3 valves. Seeds numerous, small, roundish, smooth, with a short arillus or strophiole at one end, embryo straight in the axis of the fleshy endosperm.

Habitat.—A very familiar plant and a favourite in gardens. It has an extensive range, being found throughout Europe, including our own country (where, however, it is not considered to be wild in the north), Western Asia to Cashmere, Siberia and N. Africa. It was formerly cultivated for medicinal use at Stratford-on-Avon, but is not at the present time. The familiar flowers which appear in early spring are usually barren; those which produce fertile seed being apetalous and inconspicuous and formed later in the season; the leaves increase considerably in size after the spring flowers have faded. The white-flowered variety differs also in the want of the dark veins in the lower petal and the tufts of hair on the lateral ones (*V. imberbis*, Leight.).

Syme, E., Bot., ii, p. 14; Hook. f., Stud. Fl., p. 44; Watson, Comp. Cyb. Br., p. 107; Gr. & Godr., Fl. France, i, p. 177; Boiss., Fl. Orient., i, p. 458; Hook. f., Fl. India, i, p. 184; Ledeb., Fl. Ross., i, p. 249; Lindl., Fl. Med., p. 97.

Part Used and Name.—Viola; the recent petals or flowers. Not official in the British Pharmacopœia, or the Pharmacopœia of India, or the Pharmacopœia of the United States. But the

flowers were formerly official in the London, Edinburgh, and Dublin Pharmacopœias.

Collection, General Characters, and Composition.—Violet flowers should be gathered immediately they are expanded. When fresh they have a beautiful bluish-purple or deep violet colour, a very agreeable odour, and a slightly bitter taste. When carefully dried they retain their colour; but their odour is in a great measure lost. When chewed they tinge the saliva blue. They yield their properties to boiling water; and these may be preserved for some time by means of sugar in the form of syrup of violets.

The chief constituents of the flowers are an *odorous principle, blue colouring matter,* and *sugar.* Boullay also discovered in the root, leaves, flowers, and seeds of this plant, an alkaloid, resembling the *emetia* of ipecacuanha, which he termed *violine.* This alkaline principle was found by Orfila to be an energetic poison. It may probably prove to be identical with emetia.

Medical Properties and Uses.—Violet flowers possess slightly laxative properties, but they are very rarely used at the present day. The best form of administration is the syrup of violets, which may be given as a laxative to infants, in doses of half a teaspoonful to a teaspoonful or more, with an equal quantity of oil of almonds. Syrup of violets has also been used to give colour and flavour to other medicines.

Syrup of violets, as well as their aqueous infusion, also afford a very delicate test for acids and alkalies, being reddened by the former, and changed to a green by the latter.

On the Continent, the herbaceous parts of this and some other species of violet, more especially of *Viola tricolor,* the common Heartsease or Pansy, have been also employed for their mucilaginous, demulcent, and expectorant properties. The root and seeds are also emetic and purgative, which properties, as well as the expectorant action of the plant, are doubtless due to the presence of violine or violia.

Per Mat. Med., vol. ii, pt. 2, p. 573; Christison's Disp., p. 946; U. S. Disp., by W. & B., p. 898; Watts, Dict. Chem., vol. v, pp. 1000 and 1001; Steph. & Church., by Burnett, vol. i, pl. 29; Journ. de Pharm., vol. x, p. 23, and Jan., 1824.

DESCRIPTION OF PLATE.

From a specimen flowering in Kew Gardens in the spring; the fruit added from Berg and Schmidt.

1. Vertical section of the flower.
2. The andrœcium.
3. Fruit.
4. Transverse section of the same.
5. Vertical section, and—6. External view of the seed.

(1–6 enlarged.)

Viola pedata, *Linn.*

Bird's Foot Violet.

Official Part and Name.—The herb of *Viola pedata,* a common plant in the United States of America, was formerly official in the U. S. P. But in the U. S. P. of 1875 the root is alone official, as follows: — VIOLA, *Violet;* the root (U. S. P. *Secondary*).

General Characters, Composition, Medical Properties, and Uses.—The flowers, herb, and root of this plant possess analogous characters and properties, as the similar parts of *Viola odorata,* and may therefore be employed in like cases. Their chemical composition is also probably the same, although this has not been accurately determined.

U. S. Disp., by W. & B., p. 898.

D.Blair ad sicc del et lith.

M&N Hanhart imp

CANELLA ALBA, *Murr*

N. Ord. CANELLACEÆ. Lindl., Veg. K., p. 442; Baill., Hist. Pl. i (under *Magnoliaceæ*); Le Maout & Dec., p. 243.

Genus Canella,* *P. Browne.* B. & H. Gen., i, p. 121; Baill., l. c., p. 185; Miers, Contrib. Bot., i, p. 112. Species 2, natives of the W. Indies, Florida, and Columbia.

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26. Canella alba, *Murray, Linn. Syst. Veg., ed.* 14, iv, *p.* 443 (1784).

White Wood. Wild Cinnamon (Jamaica).

Syn.—Winterania Canella, *Linn.* Canella Winterana, *Gaertn.*

Figures.—Trans. Linn. Soc. Lond., i, t. 8, cop. in Woodv., t. 237, Hayne, ix, t. 51, and Steph. & Ch., t. 66; Nees, t. 418; Baill., l. c., figs. 211–215; Miers, l. c., t. 23 A (seed).

Description.—An evergreen tree, reaching 30 or 40 feet in height, and much branched above, with a silver-grey bark on the young branches. Leaves numerous, alternate, without stipules, shortly stalked, 2—5 inches long, oblong-ovate, blunt at the apex, tapering at the base, quite entire, thick, smooth, shining above, paler below, the younger ones with immersed pellucid glands. Inflorescence consisting of small, much branched, terminal corymbs, shorter than the leaves, the pedicels about as long as the flowers, $\frac{1}{6}$ inch, or a little more. Sepals 3, rounded, coriaceous, short, persistent, strongly imbricated. Petals 5, two or three times as long as the sepals, oblong, erect, fleshy, blunt, imbricated, the 2 innermost narrower, pale violet-coloured. Stamens hypogynous, monadelphous, combined into a rather fleshy tube a little shorter than the petals, anthers apparently 10, forming a ring of 20 closely placed equal linear cells adnate to the outer surface of the tube, extrorse, tube prolonged a little beyond the anther-cells, margin entire. Pistil flask-shaped, sessile, smooth, pellucid-punctate with immersed glands; style short, thick; stigma faintly bilobed at about the level of the top of the staminal tube; ovary 1-celled, with 4 reniform ovules attached in pairs to 2 opposite parietal

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* *Canella,* from *canela,* the Spanish word for cinnamon.

placentas. Fruit a berry, about ½ inch long, rounded-ovoid, fleshy, when ripe blue-black, glossy, supported at base by the persistent calyx, shortly pointed at apex. Seeds 2 to 4, immersed in mucilage, somewhat irregular in form, roundish-reniform or angular from pressure, testa black, shining, brittle, hilum minute, inner coat membranous, thick; embryo small, very excentric, curved, lying at the upper end of a copious fleshy endosperm, radicle thick, near the hilum.

Habitat.—This is a native of the wooded hills of Jamaica, Cuba, and other of the West Indian Islands, the Bahamas, and the south of Florida, forming, when well grown, a handsome tree with abundant laurel-like foliage. The flowers have an exquisitely sweet aromatic smell, due to the secretion in the glands studding the ovary. It is in cultivation in our Botanic Gardens, but has not flowered at Kew. In Nees' figure above quoted, the flowers are coloured scarlet, probably from confusion with *Cinnamodendron.*

Miers, Contrib. Bot., i, p. 112; Swartz, in Trans. Linn. Soc., i, p. 96; Grisebach, Fl. Brit. W. Indies, p. 109; Chapman, Fl. South. States, p. 43; Lindl., Fl. Med., p. 116.

Official Part and Name.—Canellæ Albæ Cortex; the bark (B. P.). The bark (I. P.). Canella; the bark (U. S. P.).

Collection and Commerce.—It is said to have been collected formerly by first removing the entire bark with an iron instrument, then depriving it of a portion of its external cellular coats, and drying the remaining bark in the shade. But from recent information communicated to Hanbury, it appears that it is now collected in the Bahama Islands, where it is called *white wood bark* or *cinnamon bark*, as follows:—Preparatory to being stripped from the wood, the bark is gently beaten with a stick, which removes the suberous layer; by a further beating, the remaining bark is separated, and having been peeled off and dried, is exported without further preparation. It is shipped to Europe from Nassau, in New Providence.

General Characters and Composition.—Canella alba bark occurs

in more or less broken quills or pieces, which vary in length from two inches to a foot or more, in width from half an inch to one or two inches, and in thickness from one to two or three lines. The bark is generally somewhat twisted, and in some samples it is very much bruised and fissured longitudinally in consequence of the beating to which it has been subjected to in its removal from the wood. Externally it has a pale orange-brown or buff colour, and is usually marked by slight transverse wrinkles, and evident rounded depressions or scars. Internally it has a yellowish-white colour, and is nearly or quite smooth. It breaks with a short granular fracture, and the fractured surface shows distinctly the two layers (*mesophlæum* and *endophlæum*) of the bark, of which the canella of commerce is essentially composed. It has an aromatic, agreeable odour, resembling a mixture of cloves and cinnamon, and a bitter, pungent, acrid taste.

The principal constituent of Canella alba bark is a *volatile oil*, which was formerly said to be scented with oil of cloves, and sold for it. The amount of oil obtainable from canella alba bark varies from about 0·75 to 0·90 per cent. Canella alba bark also contains about 8 per cent. of *mannite*, which was formerly regarded as a peculiar saccharine substance, and named *canellin ;* and also a *bitter principle*, which has not been isolated.

Substitutes.—Canella alba bark has been confounded with *Winter's Bark*, obtained from Drimys Winteri, *Forster*, a tree of the order Magnoliaceæ, and hence has been called *Spurious Winter's Bark*. The bark of a tree botanically allied to *Canella alba*, namely, the *Cinnamodendron corticosum*, Miers, which will be afterwards described, has been, however, known and used as Winter's Bark, both in England and elsewhere for a long period of time, and is, therefore, probably the bark referred to by writers for which canella alba bark was said to be substituted. Both kinds of Winter's bark may be readily distinguished from Canella alba bark by their general characters, and also chemically as follows :—A decoction of Cinnamodendron bark and also of true Winter's bark is blackened by a persalt of iron, which is not the case with that of Canella alba bark. By the addition of

potash to a cold aqueous infusion of true Winter's bark, a dark somewhat violet colour is also produced; whereas an infusion of Canella alba bark is but slightly altered under the same circumstances.

Medical Properties and Uses.—Canella alba bark is an aromatic stimulant and slight tonic. It is now, however, but rarely used except in combination with tonic or purgative medicines, as aloes, rhubarb, &c. It has been employed in dyspepsia, chronic forms of gout, rheumatism, syphilis, and other cases where a warm aromatic is indicated. In the West Indies it is used by the negroes as a condiment, and is also regarded as useful in scurvy.

Per. Mat. Med., vol. ii, pt. 2, p. 532; Pharmacographia, pp. 19 and 68; Guibourt, Drogues Simples, tome iii, pp. 681 and 682; U. S. Disp., by W. & B., pp. 207 and 1720; Journ. de Pharm., vol. v, p. 481, and vol. viii, p. 197.

DESCRIPTION OF PLATE.

Drawn from a Jamaica specimen communicated by Mr. Miers.

1. A twig with leaves and flowers.
2. Vertical section of flower.
3. A flower with the petals removed.
4. The staminal tube laid out.
5. Transverse section of ovary.
6. Fruit.
7, 8. Seeds.
9. Section of the same.

(2–5 and 9 enlarged.)

CINNAMODENDRON CORTICOSUM, Mart.

N. Ord. CANELLACEÆ.

Genus Cinnamodendron,† *Endlicher*. B. & H., Gen., i, p. 121; Baill., Hist. Pl., i, p. 186; Miers, Contrib. Bot., i, p. 118. Species 2, one Brazilian, the other West Indian.

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27. Cinnamodendron corticosum, *Miers in Ann. Nat. Hist. ser.* 3, i, *p.* 350 (1858).

Red Canella, Mountain Cinnamon (Jamaica).

Figures.—Miers, Contrib. Bot., i, t. 24 b; Schnitzlein, Iconographia, t. 216*; Bot. Mag., t. 6120 (Sept., 1874); Fl. Brasil, fasc. 55, t. 105 (fruit).

Description.—A small tree 10—15 feet high, but growing sometimes to a far greater size (even it is said to 90 feet in height), with slender flexuose terete branches, and a smooth brownish-grey bark, marked with small orange lenticels. Leaves alternate, very shortly stalked, without stipules, oblong-lanceolate, 4 or 5 inches long by $1\frac{1}{4}$—$1\frac{3}{4}$ wide, acute at the base which is often unequal-sided, rather attenuate at the apex, entire, the margins somewhat reflexed, thick, smooth and shining on both sides, paler and very minutely pellucid-punctate beneath. Flowers about $\frac{1}{4}$ inch long, in small clusters of 1—4 in the axils of the leaves and scarcely exceeding the petioles, on short, slender, slightly pubescent pedicels. Sepals 3, imbricate, rounded, fleshy, slightly ciliate, yellowish-green, persistent. Petals in two rows, outer row 5, erect, concave, imbricate, oblong, blunt, fleshy, bright scarlet externally, orange and viscous within, the 2 outermost broader; inner row (corona, *Eichler*) 5 alternating with those of the outer row and somewhat shorter than them, narrowly spathulate-oblong, blunt, imbricate, thin, dotted with small transparent immersed glands. Stamens completely combined into a hypogynous, smooth, fleshy, cylindrical, pellucid-punctate tube about as long as the inner petals, anthers as in *Canella*, but some

† *Cinnamodendron*, Cinnamon-tree, in allusion to the qualities of the bark.

of the cells (normally 20) frequently more or less abortive, and thus varying in number, orange, dehiscing vertically. Pistil superior, cylindrical flask-shaped, smooth, surrounded at the base by a short, white, cup-shaped hypogynous disk; ovary large, 1-celled, with 5 (or 4) large and prominent parietal placentas, to which are attached numerous (about 60) uniform stalked ovules; style short and thick, slightly narrower than the ovary, extending just beyond the staminal tube; stigmas 5 (or 4) in a star round the capitate summit of the style. Fruit a smooth broadly ovoid berry $\frac{1}{2}$ inch long, somewhat tapering at the base, and supported by the persistent, thickened sepals, with a strong blunt point at its apex, 1-celled; pericarp thin, with the 5 (or 4) large dilated placentas projecting far into the cavity, and the 10—20 seeds (some abortive) densely packed and surrounded with mucilage. Seeds about $\frac{1}{10}$ inch long, somewhat reniform, compressed and slightly keeled, surface finely shagreened, bright brown, with the small hilum in the concavity, inner coat membranous, white; embryo very small, excentric, curved, near the surface of the copious rather fluid endosperm, radicle long, terete, near the hilum, cotyledons small.

Habitat.—This tree is confined to the island of Jamaica, where it seems to be local, growing in the higher mountain woods of S. John, S. Thomas in the Vale and Bath parishes. Though long known, this tree remained undescribed till less than twenty years ago, when Mr. Miers gave full and accurate botanical characters. It is stated in the 'Botanical Magazine' to grow also in the island of S. Thomas. Specimens have been in cultivation at Kew and the Botanic Society's garden for some years, and it flowered for the first time in the latter place in 1874.

In our description of the floral envelopes we have followed Miers and Eichler; the authors of the 'Genera Plantarum' consider the outer envelope as 3 bracts, and the "corona" as a corolla, our corolla being the calyx. The details of the 'Bot. Mag.' figure are incorrect, especially the ovary, which is represented as 3-celled.

The only other species of the genus is the Brazilian *C. axillaris*,

Endl., figured in 'Flora Brasiliensis' fasc. 55, t. 105; the bark of this is used locally in fevers, and called "Casca Paratudo."

Miers, Contrib. Bot., i, p. 121; Grisebach, Fl. W. Indies, p. 109.

Part Used and Name.—Cinnamodendron, *Spurious Winter's Bark;* the bark. It is not official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United States. The true Winter's Bark, obtained from *Drimys Winteri,* Forster, was official in the United States Pharmacopœia of 1850, and also in the Dublin Pharmacopœia of 1826.

General Characters and Composition.—This bark has been already referred to under the head of *Canella alba,* as the one long known and used in England and elsewhere for the true Winter's Bark, and therefore, as being probably the bark commonly referred to by writers, for which Canella Alba bark was formerly said to be substituted; hence it has been termed *Spurious Winter's Bark.* It is found in quills, which are commonly ten, twelve, or more inches in length, and one or two inches in diameter. It is covered by a thin corky outer coat, which has a dull reddish-grey or ferruginous-brown colour, and is marked with rounded depressions or scars. Internally it is yellowish-brown, reddish-brown, or of a deep chocolate colour. Its fracture is short and granular, but somewhat fibrous internally. It has an agreeable aromatic odour resembling cinnamon, and a very pungent taste, without any bitterness. Cinnamodendron bark may be readily distinguished from true Winter's Bark for which, as just noticed, it has been commonly substituted, both by its structural and chemical characteristics. Thus the latter is marked on its inner surface by very rough striæ, caused by the great contraction of the inner layer in drying, while the inner surface of the former is nearly smooth; and while a decoction of true Winter's Bark is not sensibly altered in colour by iodine, that of Cinnamodendron Bark is changed to a deep purplish-brown under the same circumstances.

Cinnamodendron bark may be also readily distinguished from Canella Alba bark, by the darker colour of its inner surface; and

by its decoction being blackened by a persalt of iron, which is not the case with that of Canella alba bark.

We have no proof of Cinnamodendron bark having been analysed, but amongst its constituents would appear to be *volatile oil* and *tannic acid.*

Medical Properties and Uses.—The true Winter's bark was formerly regarded as stimulant, tonic, aromatic, and antiscorbutic, and was employed in similar cases to canella alba and cinnamon barks. Its use is now nearly obsolete in Europe and the United States of America, although still much employed in South America as a remedy in diarrhœa, and other diseases.

Cinnamodendron bark has similar properties, and may be therefore used in like cases.

Per. Mat. Med., vol. ii, pt. 2, pp. 532 and 674; Christison's Dispensatory, 2nd ed., p. 402; Pharmacographia, p. 19; U. S. Disp., by W. & B., p. 1720; Guibourt, Drogues Simples, tome iii, p. 681.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Royal Botanic Society's Garden, Regent's Park, flowering in July; the fruit added from a Jamaica specimen in the herbarium of the British Museum; the bark from the Museum of the Pharmaceutical Society.

1. A branch with leaves and flowers.
2. A flower.
3. Vertical section of the same.
4. The staminal tube spread out.
5. The pistil.
6. Transverse section of ovary (the placentas should be larger).
7. Fruit.
8. Transverse section of a berry.
9. A seed.
10. Section of the same.
11. Piece of bark.

(2–6 and 8–10 more or less enlarged.)

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7
8

RATA *R.Br*

M & N Hanhart imp.

Nat. Ord. Bixaceæ. Le Maout & Dec., p. 243; Baill., Hist. Pl., iv.

Tribe *Pangieæ*. Lindl., Veg. Kingd., p. 323 (N. Ord.).

Genus Gynocardia,* *R. Br.* B. & H., Gen., i, p. 129; Baill., l. c., p. 317. There is but a single species.

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28. Gynocardia odorata, *R. Brown in Roxb., Pl. Coromandel, p.* 95 (1819).

Chaulmoogri. Petarcurrah.

Syn.—Chaulmoogra odorata, *Roxb.* Chilmoria dodecandra, *Ham.*

Figure.—Roxburgh, Pl. Coromandel, t. 299.

Description.—A large tree, much branched; branches slender, bark rather smooth, ash-coloured. Leaves alternate, somewhat drooping, distichous, shortly stalked, without stipules, 6—10 inches long, rounded at the base, suddenly acuminate and acute at the apex, quite entire, glabrous, shining above, veins very prominent beneath. Flowers unisexual, dicœcious, large, on smooth curved peduncles 1—2 inches long, coming off in large clusters usually from the trunk in the female, or in smaller ones usually from the younger branches in the male tree; bracts minute, round the base of the peduncles. Male flower :—calyx cupshaped, irregularly splitting into (usually) 3 segments, thick, smooth; petals 5, large, spreading, strongly imbricate in the ovoid bluntly pointed buds, about $\frac{3}{4}$ inch long, oval, obtuse, thick with thin margins, smooth, pale yellow, each provided with an ovate, acute, denticulate, thin, dark yellow, spreading petaloid scale attached to its base and scarcely $\frac{1}{3}$ its length; stamens very numerous, hypogynous, spreading, shorter than the petals, filaments tapering, hairy, anthers linear, basifixed; no pistil. Female flowers :—calyx and corolla as in the male, but the petals somewhat larger; stamens represented by 10—15 small, linear, erect, hairy staminodes around the ovary; ovary very large, ovoid, rounded on the summit, smooth, 1-celled, with numerous ovules attached to 5 parietal

* *Gynocardia*, from γυνή, pistil, and καρδία, heart; from the form of the stigmas (?).

yield by expression a fatty oil, of a greenish colour, and with an odour somewhat resembling that of Chaulmugra, but more acrid. When treated with sulphuric acid in the way above mentioned in the case of Chaulmugra oil; the cold drawn oil is described by Dymock as forming a tenacious resinous mass like it, while the rest of the oil turns of a light green colour; while the boiled oil, which is of a deeper green colour, when treated with acid, becomes at first of a sienna brown, and ultimately a light green colour. Hence these oils may be readily distinguished from the oils prepared in a like manner from chaulmugra seeds. They have similar properties, and are used both internally and externally in similar cases to those of chaulmugra.

Pharmacopœia of India, pp. 27 and 440; Pharmacographia, p. 71; Bengal Disp., p. 207; Mouatt, in Indian Ann. of Med. Sci. (1854), vol. i, p. 648, and Amer. Jl. of Med. Sci., N. S., vol. xxx, p. 493; Hobson, in Edin. Med. Journ., July, 1855, p. 50; Dymock, in Pharm. Journ., ser. 3, vol. vi, p. 761.

DESCRIPTION OF PLATE.

Drawn from specimens in the Herbarium and Museum at Kew, collected by Cleghorn and Hooker and Thomson in India.

1. Branch of a male tree with flowers.
2. A stamen.
3. A female flower.
4. Stigmas.
5. Fruit.
6. Section of the same.
7. A seed.
8. Vertical section of the same.

(2, 4 enlarged.)

D Blair ad nicc. del et lith

M&N Hanhart

POLYGALA SENEGA, *Linn.*

N. Ord. POLYGALACEÆ. Lindl., Veg. K., p. 375; Le Maout & Dec., p. 249; Baill., Hist. Pl., vol. v.

Genus Polygala,* *Linn.* B. & H., Gen., i, p. 136; Baill., l. c., p. 87. Species about 200 or more, natives of all parts of the world in temperate and warm countries.

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29. Polygala Senega,† *Linn., Sp. Plant., ed.* 1, *p.* 704 (1753).

Rattlesnake-root. Seneca Snake-root.

Figures.—Woodville, t. 162?; Barton, ii, t. 36, cop. in Steph. & Ch., t. 103; Bigelow, t. 30; Nees, t. 412; Hayne, xiii, t. 21; Berg & Sch., t. 10 a; Bot. Mag., t. 1051; Gray, Ill. Gen. U. S., t. 183.

Description.—A perennial herb, with numerous slender, wiry, erect, smooth, simple stems, 6—12 inches high, coming off from the somewhat dilated knotty crown of a thick, hard, contorted, slightly branched, irregular root. Leaves very small at the base of the stems, becoming larger upwards, alternate, sessile, exstipulate, narrowly lanceolate, acute at both ends, smooth, the margins rather rough, pale below. Flowers small, numerous, shortly stalked, crowded in a narrow terminal spike 1—2 inches long. Sepals 5, persistent, of which the upper one and two lower are small, green, lanceolate, and acute, and the two lateral (inner) ones (wings) large, petaloid, slightly veined, orbicular and concave, enclosing the petals. Petals 3, hypogynous, united below, the two lateral oblong, blunt, veiny, the lower one cup-shaped, and provided at the end on the exterior with a tuft of filiform processes (crest). Stamens 8, lying in the lower petal, united into two bundles of 4 (diadelphous), the bundles fused below with the petals, free above; anthers very small, 1-celled, opening by a pore at the apex. Ovary laterally compressed, 2-celled by a transverse partition, with one pendulous ovule in either cell; style large, curved upwards into a thick blunt beak. Fruit

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* *Polygala*, from πολύς, much, and γάλα, milk; from the supposed effects.

† *Senega*, from the Seneca tribe of North American Indians, among whom the plant was used as a remedy for snake-bites.

a small 2-celled capsule, partially covered by the persistent calyx-wings, dehiscing loculicidally. Seeds 2, black, hairy, with a white caruncle extending from the hilum along the inner side almost to the other end of the seed; embryo in the axis of scanty endosperm, straight, with flat cotyledons.

Habitat.—A native of North America, extending from the northern parts of Canada, through the Northern United States southward, to North Carolina and Tenessee, found in woods and growing in dry rocky soil. It flowers in May and June, is quite hardy, and was formerly in cultivation in our botanic gardens, but is not now to be met with in those to which we have had access.

Hook., Fl. Bor. Am., i, p. 85; Gray, Man. Bot. U. S., p. 122; Chapman, Fl. South. States, p. 85; Lindl., Med. Bot., p. 125.

Official Part and Names.—Senegæ Radix; the dried root (B. P.). The dried root (*Senegæ Radix*) (I. P.). Senega; the root (U. S. P.).

Collection.—It is collected for use in the southern and western parts of the United States, whence it is forwarded to Europe and other parts of the world.

General Characters and Composition.—*Senega, Seneka,* or *Seneca root,* or as it is sometimes termed *Seneka Snake-Root,* varies in thickness from that of a straw to that of the little finger; it is tapering, branched, twisted or somewhat spiral, and terminated at its upper end in a thick irregular knotty crown or tuberosity, which exhibits traces of numerous wiry aerial stems, and scaly rudimentary leaves. A projecting line or keel-shaped sinewy looking ridge extends along the whole length of the concave side of the root. The bark is more or less wrinkled, somewhat knotted, transversely cracked so as to be partially annulated, horny, translucent, and varying in colour from light yellowish-grey in the branches and smaller roots to brownish-grey in the larger pieces. The bark surrounds a white central woody column or meditullium, which is about the same thickness as itself. Senega root is brittle, and presents a short fracture; its odour is peculiar,

disagreeable, and rancid; and its taste at first sweetish, but ultimately very acrid and sourish, and when chewed exciting cough and salivation. The odour and taste reside entirely in the bark or cortical portion, the meditullium being quite inert.

Senega root owes its properties essentially to the presence of a peculiar principle which has been termed *senegin* or *polygalic acid*, which is said to be closely allied to *saponin*. Senega root also contains a little *volatile oil*, *resin*, *sugar*, and other unimportant constituents. Senegin is a white amorphous powder, insoluble in cold water and ether, but soluble in alcohol and boiling water, with which latter it forms a feebly acid frothy solution. According to Procter, the root yields about 5½ per cent. of senegin, which is present in the bark only. Senegin is a poisonous substance, with a very acrid taste, and excites violent sneezing. Quevenne regards it as a *glucoside*, as it is resolvable by the dilute mineral acids and alkalies into a jelly-like substance called *sapogenin*, and *sugar*, which remains in solution.

Adulterations.—Senega root does not appear to be intentionally adulterated, but from carelessness in collection some other roots or rhizomes in small proportion may be frequently found mixed with it. American Ginseng root, from *Panax quinquefolium*, is that most commonly found, and is readily distinguished by its greater size, more or less fusiform shape, and by the absence of any projecting line. The roots of *Gillenia trifoliata* and other species of *Gillenia*; and the rhizome of *Cypripedium pubescens* have also been noticed in parcels of senega root. They are readily distinguished by the absence of any projecting line, and by their different taste and odour.

Medical Properties and Uses.—Senega root was introduced into practice as a remedy for the bite of the rattlesnake, but it is now known to be useless in such a case, and also in the bites of other venomous reptiles. Senega root appears to excite, more or less, nearly all the secretions, acting as a sialagogue, diaphoretic, expectorant, diuretic, and emmenagogue, in moderate doses; and as an emetic and cathartic in large doses. It is, however, chiefly employed as a stimulating expectorant. It has been much used,

and is regarded generally as a valuable remedy in chronic bronchitis and chronic pneumonia. It has also been employed in croup, whooping-cough, humoral asthma, dropsy depending on kidney disease, palpitations connected with disease of the heart, amenorrhœa, dysmenorrhœa, rheumatism, and other diseases. It is frequently combined with great advantage with carbonate of ammonia, as in chronic bronchitis, and also with other expectorants and diuretics, as squill, &c.

Per. Mat. Med., vol. ii, pt. 2, p. 566; Pharmacographia, p. 72; U. S. Disp., by W. & B., p. 795; Garr., Mat. Med., p. 211; Journ. de Pharm., vol. xxii, p. 449, and vol. xxiii, p. 227; Amer. Journ. Pharm., vol. xxvii, p. 45, and March, 1860, p. 150.

DESCRIPTION OF PLATE.

Drawn from specimens in the British Museum collected in Virginia and Ohio, U. S. A.

1. Upper part of a flowering stem.
2. Lower portion of a plant.
3. Calyx seen from below.
4. Vertical section of the flower.
5. Corolla and stamens seen from above.
6. Plan of the flower.
7. Capsule.
8. Vertical, and—9. Transverse section of the same.
10, 11. Seed, showing the caruncle.
12. Vertical, and—13. Transverse section of seed.

(3–13 enlarged.)

D Blair del. et lith.

M & N Hanhart imp.

KRAMERIA TRIANDRA *Ruiz et Pavon*

N. Ord. POLYGALACEÆ.

Tribe *Krameriæ*.

Genus **Krameria**,* *Loefling*. B. & H., i, p. 140; Berg, in Bot. Zeitung, 1856, 745, &c.; Baill., v, p. 92. Species 20 or more, natives of the hotter parts of N. and S. America.

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30. Krameria triandra, *Ruiz & Pavon, Fl. Peruv.*, i, *p.* 61 (1798).

Ratanhia, Mapato, Pumacuchu (Peru).

Figures.—Ruiz & Pav., l. c., t. 93, cop. in Hayne, viii, t. 14, Nees, t. 413, Steph. & Ch., t. 72, and Woodville, vol. v; Berg & Sch., t. 3 f; Baill., l. c., figs. 116–121.

Description.—A low shrub with long decumbent branches and many spreading, bare, cylindrical twigs covered with a dark greyish-brown bark, when young hoary with erect silky hairs; root-crown large and thick, with very long cylindrical branches reaching $\frac{5}{8}$ inch in diameter and covered with a thick bark blackish-red outside and orange red within. Leaves alternate, irregularly scattered or crowded, sessile, $\frac{1}{2}$ inch long, obovate- or oblong-lanceolate, apiculate, entire, covered on both surfaces with longish, adpressed, silvery hairs, very dense and somewhat rufous on the young leaves and buds. Flowers rather large, at the extremities of short branches from the axils of the upper leaves, each with two small opposite leaves a little below the flower. Sepals 4, imbricate, spreading cross-wise, lanceolate, the two lateral ones smaller, externally densely silky, internally quite smooth, shining and scarlet. Petals 4, dissimilar, red, the two posterior in front of the posterior sepal, separate, thick, spathulate, acute; the two anterior small roundish, thick, concave and smooth within, scaly on the outside. Stamens 3, hypogynous, about half as long as the spathulate posterior petals and alternating with them, filaments fleshy, thickened upwards, red, anthers urceolate, 2-celled, opening at the top by a large circular orifice bordered with very short hairs; ovary ovoid-spherical,

* *Krameria*, dedicated to Dr J. G. H. Kramer, a Hungarian physician.

almost as long as the filaments, densely covered with bright white long silky hairs, 1-celled with two collateral pendulous ovules, style long, tapering, red. Fruit spherical, $\frac{1}{4}$ inch in diameter, leathery, covered with white silky hairs and beset with numerous slender tapering, brownish-red spines, about $\frac{1}{4}$ inch long, and with several barbed deflexed hooks at the end, indehiscent. Seed (not seen) solitary, ovoid, sharp at each end, embryo straight, in the axis of the endosperm, with a long radicle and small plane-convex cotyledons.

Habitat.—A native of Peru, where it grows in dry sandy places on mountain-slopes at 3000—8000 feet above sea-level in several provinces, and is especially abundant near the city of Huanuco. It flowers nearly all the year, but chiefly in October and November; the Spanish name is "Raiz para los dientes," from its use as a dentifrice. It has not been grown in England.

The very curious genus *Krameria* has been considered to form a distinct family by Kunth and by Lindley, and A. Gray has suggested placing it among the Leguminosæ Cæsalpineæ. Most authors, however, now concur in making it a very anomalous member of the Polygalaceæ. In the 'Genera Plantarum' the seeds are described as without albumen; we have not been able to examine a seed, but this was evidently very carefully done by Berg and Schmidt, and we have followed them in the above description.

Ruiz & Pavon, Fl. Peruv., i, p. 61; Berg, in Bot. Zeit., 1856, p. 766; Lindl., Fl. Med., p. 128.

Official Part and Names.—Krameriæ Radix, *Rhatany Root;* the dried root (B. P.). The dried root (*Krameriæ* vel *Rhataniæ Radix*) (I. P.) Krameria; the root (U. S. P.).

In order to distinguish this kind of Rhatany from the other varieties noticed under the head of *Krameria Ixina*, it is termed *official rhatany;* or from the fact of its being imported from Peru, Peruvian or Payta Rhatany; or from its colour, *Red Rhatany.*

General Characters and Composition.—Peruvian, Payta, or Red

Rhatany root, as found in commerce, either consists of long, cylindrical, simple or branched pieces, which vary in thickness from $\frac{1}{4}$ to $\frac{1}{2}$ an inch, or more; or more frequently of a short thick portion which is generally much knotted, and as large as a man's fist, to which is attached a variable number of short, stumpy, more or less broken branches. The former is sometimes known as *long rhatany*, and the latter as *short* or *stumpy rhatany*; the first sort is preferred. These differences in the appearance of rhatany are caused by the varying modes in which the roots are collected. Thus if the root-diggers bestow the needful care in removing the roots from the soil, the long variety will be obtained; while if the roots are torn from the soil with force, the short or stumpy variety is the result. Rhatany root consists of a thin, readily separable bark, varying in thickness from about $\frac{1}{20}$ to $\frac{1}{10}$ of an inch, rough and scaly except in the smaller pieces, and of a dark reddish-brown colour externally, and bright brownish red on its inner surface; and of a very hard central woody portion, of a brownish- or reddish-yellow colour. The bark breaks with a somewhat fibrous fracture, is tough and difficult to powder, and has a strong, purely astringent taste. The wood is almost tasteless. When chewed rhatany root tinges the saliva red. Neither bark nor wood has any marked odour. The virtues of rhatany essentially reside in the bark, and hence the smaller pieces are to be preferred, as they have the largest proportion of bark.

The essential constituent of rhatany is a form of tannic acid, which is called *Rhatania-tannic Acid* or *Krameria-tannic Acid*. It was found by Wittstein in the bark in the proportion of about 20 per cent. It is closely allied to catechu-tannic acid. Rhatania-tannic acid is an amorphous powder; its solution affords a dark greenish precipitate with perchloride of iron, but it is not affected by tartar emetic. By the action of dilute acid it is decomposed into a crystallisable sugar and *Ratanhia-red*, which latter substance may also be found ready formed in the bark. No gallic acid is present in rhatany root.

Formerly an extract of rhatany was occasionally imported

from South America, and was official in the Dublin Pharmacopœia, but nothing definite is known about it, and it is not now to be met with, at least in Great Britain. It is interesting from the fact of Wittstein having discovered in it a crystalline body, which he regarded as identical with *tyrosine;* but other chemists, as Stadëler and Ruge, have described it under the name of *Ratanhin,* as according to them, it has a different composition to tyrosine.

Medical Properties and Uses.—The properties and uses of rhatany are similar to those of catechu; it is a powerful astringent, and like other agents of this class, tonic also. It has been found useful for internal administration in chronic diarrhœa, dysentery, menorrhagia, hæmaturia, and passive hæmorrhage from the bowels, &c.; as a gargle in relaxed sore throat; as an injection in leucorrhœa, and in fissures of the anus; and as an astringent wash to the mucous membrane of the eyes, nose, gums, &c.

The powder is also used as a dentifrice when mixed with equal parts of orris rhizome and charcoal, or with prepared chalk and myrrh.

The extract of rhatany as imported from South America, was formerly employed as an adulterant of port wine; and a strong tincture of the root in brandy is called wine colouring, and is said to be used in Portugal to give roughness to port wine.

Per. Mat. Med., vol. ii, pt. 2, p. 569; Christison's Disp., 2nd ed., p. 581; Pharmacographia, p. 74; U. S. Disp., by W. & B., pp. 514 and 1143; Gmelin's Chem., vol. xiii, p. 358; Journ. de Pharm. et de Chim., Jan., 1868, p. 73; Chem. Centralblatt, 1864, p. 1054.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected in Peru by Pavon. The root added from a pharmaceutical specimen. 1. A branch with flowers and fruit. 2. Front view of a flower. 3. Vertical section of a flower. 4. One of the anterior petals, 5. Fruit. 6. Section of the same. 7. One of the barbed spines. 8. Portion of the root. (2-4 and 7 enlarged.)

D Blair ad. sicc. del. et lith.

KRAMERIA IXINA, L.

M&N Hanhart imp.

N. Ord. POLYGALACEÆ.

Tribe *Krameriea*.

Genus Krameria, *Loefling*.

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31. Krameria Ixina,* *Linn., Sp. Plant., ed.* 2, *p.* 177 (1762).

Syn.—K. tomentosa, *St. Hil.?* K. ovata, *Berg.* K. grandiflora, *Berg.*

Figures.—Hayne, viii, t. 13; Tussac, Fl. Antilles, i, t. 15; Fl. Brasil. fasc. 63, tt. 27 and 30 C, fig. 1 (*K. tomentosa*, St. Hil.).

Description.—A shrub with very numerous, slender, terete, erect or procumbent branches, shortly downy when young, bark dark brown. Roots long, cylindrical, covered with a thick separable bark, greyish-brown externally, dark reddish-brown within. Leaves alternate, scattered, nearly 1 inch long, lanceolate, tapering into a longish cylindrical petiole, acute and mucronate, strongly pubescent on both sides, 3-nerved, the upper ones narrower. Flowers numerous, arranged as in *K. triandra*, but forming more elongated lax racemes. Sepals ovate, rather blunt, dull red; petals 5, the 3 posterior spathulate, with the limb a little crisped, slightly connected at the base; stamens 4, alternating with the posterior petals; the rest as in *K. triandra*. Fruit as in the last species, but with the spines less than half as long.

Habitat.—This species in its extended sense has a large range; being found on dry barren ground in Mexico, the West Indian islands of Haiti and Antigua, Curaçao, New Granada, several parts of Venezuela, British Guaiana, and Brazil. There are several varieties, that yielding the official root being, according to Hanbury, the var. *granatensis* of Triana, distinguished mainly by its broader leaves. This is collected for export between Pamplona and the Magdalena in New Granada. *K. tomentosa*, St. Hil., seems to be only an extreme form of this variety, but it is considered distinct by A. W. Bennett (Fl. Brasil., l. c., 70), who would restrict *K. Ixina* to the plant of the Antilles; that species, however, was originally founded on the plant of Loefling from Venezuela.

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* *Ixina*, from the native name "Ixine" at Cumana, Venezuela, where Loefling discovered the plant in 1754.

from the Peruvian rhatany is of a red colour, whilst the precipitates formed in both the other tinctures are clear violet.

Per. Mat. Med., vol. ii, pt. 2, p. 570; Per. Mat. Med., by B. & R., p. 930; Pharmacographia, p. 76; U. S. Disp., by W. & B., p. 515; Pharm. Journ., vol. xvi, 1st ser., pp. 29 and 132; Hanbury, in Pharm. Journ., vol. vi, 2nd ser., p. 460; Flückiger, in Pharm. Journ., vol. i, 3rd ser., p. 84, and vol. vi, 3rd ser., p. 21.

DESCRIPTION OF PLATE.

Drawn from a Mexican specimen collected by Pavon in the British Museum.

1. A branch with flowers and fruit.
2. Front view of a flower.
3. Section of the same.
4. One of the anterior petals.
5. Fruit.
6. Section of the same.
7. One of the hooked spines.
8. Root.

(2–4 and 7 enlarged.)

D.Blair F.L.S ad nicc. det et lith

M & N Hanhart imp

N. Ord. GUTTIFERÆ. Lindl. Veg. Kingd., p, 400 (*Clusiaceæ*); Le Maout & Dec., p. 268; Baill., Hist. Pl., vol. vi.

Tribe *Garcinieæ*.

Genus Garcinia,* *Linn.* B. & H., Gen., i, p. 174; Baill., Hist. Pl., vi, p. 422. Species about 45 (including *Xanthochymus*), natives of tropical Asia, Polynesia, and Africa.

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32. Garcinia indica, *Choisy in DC. Prod.*, i, *p.* 561, (1824).

Amsool (Maratta). *Brindall* (Portuguese).

Syn.—G. purpurea, *Roxb.* (1832), non *Wall.* G. celebica, *Desr.* non *Linn.* Brindonia indica, *Dup. Th.*

Figure.—Beddome, Ic. Plant. Ind. Or., t. 270 (*G. purpurea*).

Description.—A tree of moderate height with spreading or drooping branches; bark dark brown, smooth; young twigs cylindrical, with four elevated lines, glabrous. Leaves opposite on rather long petioles; blade oblong-lanceolate or oblong-oval, 2—4 inches long, obtuse or acute at the apex, tapering at the base, entire, thin, glabrous, bright green, reddish when young. Flowers small, unisexual, sub-dioecious; the male on short glabrous pedicels arranged in threes (rarely more) at the ends of the branchlets, or 2 or 3 together in the axils of the leaves; the female sessile, solitary or rarely 2 or 3 together in the leaf-axils. Male flowers :—Sepals 4, rounded, very obtuse, pubescent on the outside; petals 4, about twice as long as the sepals, thick, scarcely longer than the sepals. Stamens very numerous, the filaments completely fused into a quadrate-cylindrical mass, anthers nearly sessile, ovoid, 2-celled, dehiscent longitudinally, introrse, basifixed. Female or sub-bisexual flowers :—Sepals and petals as in the male; androecium represented by 4 groups opposite the sepals, of 2—7 erect, small stamens or staminodes in 1 or 2 rows, about as long as the ovary. Ovary globular, fleshy, smooth, walls very thick, cells 5 to 8 very small, stigmas sessile, large, spreading, very papillose. Fruit as large as a small orange,

* *Garcinia*, given by Linnæus to the Mangosteen tree (*G. Mangostana*) in commemoration of Laurence Garcin, who in 1734 first gave the character of the genus, and of Garcias ab Horto, who in 1567 first described the tree.

spherical, supported at the base by the persistent calyx and marked by a depression at the (usually somewhat lateral) apex, about 1½ inches in diameter, smooth, dull red or purplish, fleshy, indehiscent; pericarp thick, soft, entirely filled with a firm juicy dark purplish-red pulp imperfectly divided by the fibrous remains of the axis and dissepiments into 5—8 unequal segments, each containing in the centre a single seed, to which the pulp is adherent. Seeds large ½—¾ inch long, oblong-reniform in outline, very blunt at each end, rounded on the back, thinner on the inner edge, somewhat compressed, testa rather thin, soft, veined, brown, embryo occupying the whole seed, homogeneous, entirely without cotyledons, but with a minute depression at the apex marking the position of the plumule; no endosperm.

Habitat.—Though this tree grows both in a wild and cultivated state in the immediate neighbourhood of Bombay and, indeed, along the whole Concan coast from Daman to Goa, and although its fruit has been known for over 300 years, specimens are scarcely to be met with in our herbaria, and we have not seen the male flowers. The tree is also very common, according to Beddome, throughout northern Canara, to the south of the Concan; it is, or was, grown in the botanic garden at Calcutta, and has been imported into Mauritius and Bourbon.

The flowers appear in November and December, and the fruit, which is not unlike a purple apple and is called "Kokum" by the Mahrattas, ripens in the hot season, February to April. There is a variety with white fruit.

The embryo of *Garcinia* is remarkable in being, though of large size, almost absolutely without cotyledons; it consists merely of the thickened radicle, at the apex of which is a slight depression indicating the plumule whence a small bundle of fibres runs down the centre of the axis. The authors of 'Pharmacographia' erroneously describe the embryo of the present species as having thick inseparable cotyledons.

Roxburgh, Fl. Indica, ii, p. 624; Fl. Brit. India, i, p. 261; Planchon & Triana, in Ann. Sc. Nat., ser. 4, xiv, p. 338; Beddome, Ic. Plant. Ind. Or., t. 270; Hook. f., in Journ. Linn. Soc. Lond., xiv, p. 484; Flück. & Hanb., Pharmacogr., p. 79.

Official Part and Names.—Garciniæ purpureæ Oleum; the oil of the seeds of Garcinia purpurea, *Roxb.* (I. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of the United States. It is commonly known under the names of *Kokum Butter* and *Concrete Oil of Mangosteen.*

Preparation.—The oil is extracted from the seeds by boiling. The process described in the Pharmacopœia of India is as follows:—The seeds are first exposed for some days to the action of the sun to dry; they are then bruised and boiled in water; when the oil collects on the surface, and on cooling concretes into a solid cake; this is subsequently purified by melting and straining, and then moulded by hand into cakes or balls. The quantity of the concrete oil obtainable from the seeds by this process may be taken at about one-tenth of their weight; but this might doubtless be increased with better modes of preparation, for J. Bouis and d'Oliveira Pimentel extracted as much as 30 per cent. from the seeds by the action of ether.

General Characters and Composition.—*Kokum Butter* or *Concrete Oil of Mangosteen* is found in the Indian bazaars and elsewhere, in the form of oblong or egg-shaped cakes, which are usually between three and four inches long, two inches or more in diameter, and about a quarter of a pound in weight. It also occurs in concavo-convex cakes. At ordinary temperature it is firm, of a dirty-white or yellowish colour, friable, crystalline in structure, dry, yet greasy between the fingers like spermaceti. It has a faint not unpleasant odour when fresh; and a mild oily taste, "melting in the mouth like butter, and leaving an impression of cold on the tongue, not unlike that experienced on allowing a small piece of ice to dissolve in the mouth." When long kept kokum butter becomes brownish in colour, its surface is covered by an efflorescence of shining tufted crystals, and it acquires a rancid odour. According to Redwood, kokum butter "melts at about 98°, remains fluid until cooled to 75°, and when it then begins to solidify the temperature rises to 92°, at which it becomes solid." When extracted from the seeds by ether, J. Bouis and d'Oliveira Pimentel, found it to melt at 104°. It is

very slightly soluble in rectified spirit, but more so in hot than in cold spirit; it is, however, readily soluble in ether, one part of the concrete oil dissolving almost immediately in about two parts of cold ether. When heated with sulphuric acid it forms a crimson-red solution, and gives off sulphurous acid.

According to J. Bouis and d'Oliveira Pimentel, it consists essentially of *stearin*. The experiments of Flückiger and Hanbury show that its constituents are *stearic acid*, *myristic acid*, and *oleic acid*. When boiled with caustic soda it forms a fine hard soap.

Medical Properties and Uses.—Kokum butter has been introduced into the Pharmacopœia of India chiefly with the view of bringing it into use for the preparation of ointments, suppositories, and some other pharmaceutical preparations. Dymock says "its chief fault is, that it has a yellowish tinge, which makes ointment prepared with it inferior in appearance to that made with spermaceti." It has been employed as a local application to ulcerations, fissures of the lips, chapped hands, &c. For these purposes it may either be used by scraping a little on to hot water, or by reducing it into a loose powder, and rubbing it on the hands or face. A writer in the 'Journal of the Asiatic Society of Bengal' says "It is used by the natives as a healing application. I have noticed among its sensible properties, that it impresses a sensation of cold on the the tongue; from which it would appear that it powerfully absorbs heat, as several salts do in the act of dissolving. It is easy to conceive that this property may often be of general service in wounds or sores, accompanied with inflammation, which it is desirable to abate."

If it could be obtained in sufficient quantities, it would form a valuable substance for use in candle-making &c., for, as stated by the authors of Pharmacographia, "it yields stearic acid more easily and in a purer state than tallow and most other fats." It is used occasionally by the natives of India in cooking; and it has been stated to be largely employed in Goa to adulterate *ghee* or *liquid butter;* but Dymock says, that this latter statement is incorrect.

Other Products of Garcinia indica.—The fruit is said to have

an agreeable acid flavour, and to be eaten by the natives. Workers in iron also use the acid juice as a mordant. According to Dymock, the fruit is largely used on the western coast of India, as an acid ingredient in curries. In a dry state it is an article of commerce; it is commonly prepared by drying the pulp in the sun after the seeds have been removed; the pulp is then slightly salted, and is ready for the market. Or, in some cases, in Goa, the pulp is separated from the skin, and formed into large round or elongated masses. It appears also that the apothecaries in Goa prepare a very fine purple syrup from the fruit.

Pharmacopœia of India, pp. 31 & 441; Pharmacographia, p. 80; Journ. of the Asiat. Soc. of Bengal, vol. ii, p. 592 (1833); Pereira, in Pharm. Journ., vol. ii, ser. 1, p. 65; Bouis & d'Oliveira Pimentel, Comptes Rendus, vol. xliv (1857), p. 1355; Dymock, in Pharm. Journ., vol. viii, ser. 3, p. 565.

DESCRIPTION OF PLATE.

Drawn from a specimen preserved in spirit in the Economic Museum at Kew, collected by Mr. Woodrow; the flowers added after Beddome.

1. A branch with leaves and fruit.
2. Transverse section of the fruit.
3. A seed.
4. Transverse section of the same.
5. Embryo.
6. Vertical section of the same.
7. A male flower.
8. The same opened.
9. A female flower with the parts separated.
10. Vertical section of pistil.

(7–10 enlarged.)

C. PCILLA HAUBURII Hook.f.

N. Ord. GUTTIFERÆ.
Tribe *Garcinieæ*.
Genus Garcinia, *Linn.*

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33. Garcinia Hanburii, *Hook. f., in Journ. Linn. Soc. Lond.*, xiv, *p.* 485 (1875).

Siam Gamboge. Gamboge.

Syn.—G. Morella, *var.* pedicellata, *Hanbury*,
Figure.—Trans. Linn. Soc. Lond., xxiv, t. 50.

Description.—A tree 35—50 feet high, with many very spreading branches; bark orange-brown, thick; young shoots smooth, somewhat angular. Leaves opposite, on short petioles, without stipules, 4 to 7 inches long, oval, somewhat attenuated into the blunt twisted apex, entire, glabrous on both sides, thick, dark green above, paler and with a prominent midrib beneath. Flowers unisexual, dicœcious, of moderate size, coming from bosses in the leaf-axils on the wood of the previous years, the male on stout, straight, roughish peduncles about ¼ inch long, thickened upwards, in fascicles of 3—5 together, and each with 4 very small, shallow, imbricate, broad, acute, persistent bracts at the base; the female (slightly larger) solitary (or 2 or 3 together), apparently sessile but with a very wide, fleshy, solid base suddenly narrowed to the attachment, which is surrounded by a little involucre of 4 minute pointed bracts as in the male. Male flowers:—Sepals 4, decussate in the bud, the 2 outer rather smaller, spreading, broadly oblong, very obtuse, thin, roughish outside, concave; petals 4, alternate with the sepals, imbricate in the bud, about ¼ inch long, squarish-orbicular, without a claw, concave, very thick and fleshy, glabrous, pale yellow, easily detached and falling; stamens 30—40, the filaments completely united and fused into a single, central, entire, squarish-hemispherical mass, upon which are closely placed the small, sessile, box-like, truncate, angular, many-celled anthers, dehiscent by a circular chink; no trace of

ovary. Female flowers:—Sepals and petals as in the male, the former persistent; androecium represented by a hypogynous ring of about 20 staminodes united at the base, distinct, irregular and club-shaped at the ends; ovary large, globular-ovoid, smooth and shining, 4-celled, with a single axile ovule in each cell; style none, stigma large, capping the ovary, bluntly 4-lobed, the lobes more or less covered and bordered with wart-like teeth. Fruit the size of a crab-apple, nearly spherical, slightly depressed at the summit, and often crowned by the stigmas, smooth, fleshy, yellowish-green, surrounded at the base by the persistent sepals, 4-celled or less by abortion. Seeds solitary in the cells, rounded on the back, keeled at the inner edge; embryo filling the seed, with a large thick radicle and no cotyledons; endosperm none.

Habitat.—A native of Cambodia and Cochin-China on the east coast of the Gulf of Siam, whence the whole of the gamboge of commerce is exported. Our knowledge of the tree is, however, derived from specimens which were introduced from Siam to Singapore more than 30 years ago, of which Professor Christison published a brief account in 1851. It was not, however, till 1864 that a full botanical definition of the tree in question was given by the late D. Hanbury, in memory of whom it has been since named by Sir J. D. Hooker.

The flowers are produced in February and the fruit in May and June. There was at one time a living specimen in the Edinburgh Botanic Garden.

G. Hanburii was not considered other than a slight variety (*pedicellata*) of *G. Morella*, Desrouss., by Hanbury, and his opinion was shared by Thwaites, and more recently by Lanessan; these botanists all state that the stalked male flowers constitute the only distinguishing character, but Sir J. D. Hooker has since, from a consideration of the fruit and foliage, raised it to specific rank. Though we think its claims to such distinction but slender, we have adopted the nomenclature of Hooker for the sake of a clear definition of the plant amid much confusing synonymy.

G. Morella itself (which has the male flowers sessile) has long

been known to yield good gamboge. It grows abundantly in Ceylon and Southern India, and has received a large number of names:—*G. Gutta*, Wight, *G. elliptica*, Wall., *G. cambogioides*, Royle, *Cambogia Gutta*, Lindl. (non Linn.), *Stalagmitis cambogioides*, Murray (part), *Hebradendron cambogioides*, Graham, being the principal ones. There are figures in Wight, Illust. Ind. Bot., i, t. 44; Hook., Companion to Bot. Mag., ii, t. 27; Beddome, Fl. Sylvatica, t. 86. *G. pictoria*, Roxb. (*Hebradendron pictorium*, Graham), a native of the wet high lands of Wynaad, in Southern India, is referred to *G. Morella* by J. D. Hooker, but Beddome, who figures it in 'Flora Sylvatica,' t. 87, considers it distinct; it is also figured in Wight, Ic. Plant. Ind. Orient. t. 102. Lanessan states that this has pedunculate male flowers, and is the same as *G. Hanburii*. If this were so the latter name would be superseded; but the male flowers are undoubtedly sessile in Roxburgh's specimens; and are rightly so described by him, and correctly figured in the plates above quoted.

The species figured in Hayne ix, t. 4, and Steph. and Ch., t. 181 —both copied from Roxburgh, Plants of Coromandel, t. 298— is *G. Cambogia*, Desrouss. (*Cambogia Gutta*, Linn., *G. Papilla*, Wight), a tree also growing in South India and Ceylon. There are other figures in Wight, Ic. Plant. Ind. Orient., t. 960, and Beddome, Fl. Sylvatica, t. 85. It is closely allied to *G. indica*, Choisy (see no. 32).

Roxb., Fl. Indica, ii, p. 627; Fl. Brit. India, i, p. 264; D. Hanbury, in Trans. Linn. Soc. Lond., xxiv, p. 487 (1864); Hook. f., in Journ. Linn. Soc. Lond., xiv, p. 485; Lanessan, in Adansonia, x, p. 282, and Hist. des Drogues, p. 164; Christison, in Proc. Royal Soc. Edinburgh, ii, p. 263 (1851), and in Hook., Comp. Bot. Mag., ii, p. 233; Wight, ibid., p. 379; Royle, Mat. Medica, ed. 2, p. 350.

Official Part and Name.—CAMBOGIA; a gum-resin obtained from Garcinia Morella, *Desrouss., var.* pedicellata (B. P.). The gum-resin (I. P.). GAMBOGIA; a gum-resin (U. S. P.).

Production and Commerce.—Gamboge is imported into Europe and the United States from Singapore, Bangok, and Saigon; and is the produce of Siam, Cambodia, and the southern parts of

Cochin-China. According to König, a Roman Catholic priest who formerly resided in Cochin-China, gamboge was obtained in his time by breaking the leaves and twigs and collecting the yellow juice which exuded, either on the leaves of the tree or in cocoa-nut shells; it was then transferred to large flat earthen vessels, and allowed to harden during the summer season, and afterwards enveloped with leaves. In this way the gamboge was obtained in shapeless cakes or lumps, thus constituting *lump* or *cake gamboge*. Or, at other times, the gamboge while in the liquid state was received into joints of bamboo, in which it subsequently hardened in rolls or cylinders, and then formed the *roll* or *pipe gamboge* of commerce. At the present day, it appears to be usually obtained as follows:—At the commencement of the rainy season a spiral incision is made in the bark round half the circumference of a full-sized tree, and the juice, which then slowly exudes for several months, is received into a joint of bamboo which is placed at the lower end of the incision for that purpose. When the juice has hardened, the shell of bamboo is removed, and the gamboge is then obtained in the form of a roll or cylinder. According to Spencer St. John, a tree will yield on an average, in a season, sufficient gamboge to fill three joints of bamboo 20 inches in length by about 1½ inches in diameter. The trees should only be incised in alternate years.

General Characters and Varieties.—Gamboge is found in two forms, that is, in cylindrical pieces, termed *pipe* or *roll gamboge*; and in cakes or amorphous masses, frequently weighing several pounds, called *lump* or *cake gamboge*. The latter is inferior to the best pipe kind, being generally adulterated with rice flour, sand, and other substances; and pieces of wood, leaves, &c., are also commonly to be found intermixed with it. It is now but rarely seen in commerce, the ordinary, and commonly the best variety met with at the present time, and the one described in the British Pharmacopœia, being that termed *roll* or *pipe gamboge*. This kind occurs in sticks or rolls, varying from one to about three inches in diameter, and from four to eight inches in length; these are either solid or more or less hollow; and generally striated longitudinally with im-

pressions from the inside of the lengths of bamboo in which the gamboge juice has been received and hardened. The rolls are covered externally with a dirty greenish-yellow powder; and are either distinct, or agglutinated, or folded together, so as to form masses of varying sizes and forms. Good gamboge is brittle; its fracture is conchoidal; its fractured surface is smooth, opaque, of a uniform reddish-yellow colour and glistening appearance; and its powder is of a bright yellow colour. It has no marked odour, and but little taste at first, although subsequently disagreeably acrid. When rubbed up with water it forms a yellow emulsion; it is completely dissolved by the successive action of ether and water; and if a solution of iodine be added to an emulsion made with boiling water and cooled, it does not become green, thus showing the absence of starch, which is a common adulterant. Inferior qualities of gamboge are harder; their fractured surfaces are brownish, rough, and frequently marked with blackish spots from the intermixture of foreign substances; they are not completely dissolved by the successive action of ether and water; and solution of iodine frequently produces a green colour in the cooled emulsion.

Adulterations.—The common adulterations of gamboge are rice flour, sand, and the powdered bark of the tree. These may be readily detected by the tests already given. Fragments of wood, bark, and other substances, are also frequently to be found intermixed in specimens of gamboge.

Composition.—Gamboge is a mixture of *resin* and *gum;* the best qualities yielding from 70 to 75 per cent. of the former, and from 15 to 20 per cent. of the latter. The *gum* is soluble in cold water like gum arabic; but it is not identical with it, as its solution does not redden litmus, and neither silicate of sodium or neutral acetate of lead produce any precipitate when added to it. The *resin* possesses acid properties, and hence it is sometimes termed *gambogic acid.* The medicinal properties and colour of gamboge reside in this resin. It is obtained by evaporating an ethereal tincture of gamboge. It is cherry-red in mass, but in thin layers it has a deep orange colour, and in powder it is yellow. It is insoluble in water, but soluble in alcohol,

and still more so in ether and chloroform. Its colour is so intense that it is said to communicate a perceptible yellowness to ten thousand parts of alcohol. It forms with the alkalies dark red solutions (*gambogiates*), from which the acids throw down gambogic acid of a yellow colour.

Medical Properties and Uses.—Gamboge is a valuable drastic and hydragogue cathartic; and also possesses anthelmintic and diuretic properties. It frequently, however, produces nausea and vomiting, and in excessive doses it acts as an irritant poison. It forms the active ingredient of the once celebrated nostrum termed Morison's pills, and the deaths which formerly occurred from the excessive use of these pills were mainly attributable to the gamboge they contained. It is a valuable medicine in dropsy when given in combination with the acid tartrate of potash; in obstinate constipation it is also a very useful remedy, but when given alone as it is apt to occasion nausea, vomiting, and griping, it should be combined with other substances, as in the official compound pill of gamboge. In cerebral affections, such as apoplexy, when combined with calomel, it is also held in some esteem; and has been found serviceable as an anthelmintic, more especially in the expulsion of tape-worm. It is said to have formed an important constituent in the formerly celebrated empirical anthelmintic formula, known as Madame Nouffer's *specific*. An alkaline solution of gamboge has been recommended and employed on the Continent as a powerful diuretic.

Gamboge is also used in veterinary practice for cattle and sheep; but on account of the uncertainty and violence of its action, it is unsuited for horses or dogs.

The principal use of gamboge is not, however, as a medicine, but as a pigment in water-colour painting. It is also employed to give a colour to the lacquer varnish for brasswork, &c.

Other Sources of Gamboge.—Besides the official gamboge, other gum-resins of a like character are obtained from different species and varieties of *Garcinia*; but none of these are used in Europe or the United States, but are only locally important. Thus, in Ceylon and Southern India, good gamboge may be

obtained from the variety of *Garcinia Morella* which has *sessile* male flowers; in Travancore, good gamboge in abundance is derived from *G. travancorica*, Beddome; and in Mysore, Canara, and other parts of the Madras peninsula, the gamboge known as Indian Gamboge is obtained from *G. pictoria*, Roxb., and has been found by Christison and Broughton, fully equal to Siam gamboge, for which it might therefore form an excellent substitute.

Per. Mat. Med., vol. ii, pt. 2, p. 526; Per. Mat. Med., by B. & R., p. 902; Pharmacographia, p. 77; U. S. Disp., by W. & B., p. 418; Watts, Dict. Chem., vol. ii, p. 770; Spenser St. John, Life in the Forests of the Far East, 1862, vol. ii, p. 272; Beddome, Flora Sylvatica, Madras, pt. 15 (1872), tab. 173; Tuson's Veterinary Pharmacopœia, p. 56; Buchner, Journ. de Pharm., 3 sér., vol. iii, p. 303.

DESCRIPTION OF PLATE.

Drawn from a specimen preserved in spirit in the Kew Museum, cultivated at Singapore; the fruit added after Hanbury.

1. A branchlet of a male tree with flowers.
2. A cluster of male flowers.
3. Vertical section of a male flower.
4. An anther.
5. Twig with female flowers.
6. A female flower with the envelopes removed.
7. Vertical section of the same.
8. Transverse section of the ovary.
9. Fruit.
10, 11. Section of the same.

(2–4, 6–8 enlarged.)

M&N.Hanhart imp.

CAMELLIA THEA, *Link.*

N. Ord. TERNSTROEMIACEÆ. Lindl., Veg. K., p. 396; Le Maout and Dec., p. 271, Baill., Hist. Pl., vol. iv.

Tribe *Gordonieæ*.

Genus Camellia,* *Linn.* (including *Thea*, Linn.). B. & H., Gen., i, p. 187; Baill., l. c., p. 227 (*Thea*). Species 15 or more, growing in tropical and eastern Asia and the Indian Archipelago.

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34. Camellia Thea,† *Link, Enum. Plant. Hort. Reg. Bot. Berol. Alt.*, ii, *p.* 73 (1822).

Tea.

Syn.—Thea chinensis, *Linn.* T. viridis, *Linn.* T. Bohea, *Linn.* T. stricta, *Hayne.* T. Assamica, *Masters.* Camellia theifera, *Griffith* (1838).

Figures.—Woodville, t. 225; Hayne, vii, tt. 27, 28, 29; Nees, tt. 426–28; Bot. Mag., tt. 998 and 3148; Griffith, Notulæ ad Plant. Asiat., iv, t. 601, f. 1 and 3; Trans. Linn. Soc., xxii, t. 61 (Assam plant); Baill., l. c., figs. 244—250.

Description.—A small, much-branched, evergreen shrub, with slender branches covered with a smooth pale-brown bark; young twigs and buds downy. Leaves alternate, shortly stalked, somewhat variable in form and size, usually 2—4 inches long, oval or lanceolate, pointed at each end or bluntish and emarginate at the apex, irregularly and rather distantly dentate-serrate except at the base, thick, smooth and shining on both sides or slightly downy beneath, dark green, paler below, veins strongly marked with the leaf convex and rather bullate in the intervals. Flowers solitary or two or three together on short branchlets in the leaf-axils, somewhat drooping, on short stalks with a few small bracts,

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* George Joseph Camel, or Camelli, was a Dutch Jesuit missionary in Luzon, and a first-rate naturalist. His plants, drawings, and descriptions were sent to Holland in 1700, afterwards came in the hands of Petiver, and are now in the British Museum.

† *Thea*, a Latin rendering of the Chinese *Téh*, and first employed by Kaempfer. "Nomen barbarum," says Linnæus, who retained it, however, for this divine plant, as though *Thea* might mean *Dea* (see Hort. Cliff., p. 205).

about 1 or $1\frac{1}{2}$ inch wide. Sepals 5, imbricate, slightly united below, ovate or rounded, blunt, smooth, persistent. Petals usually 5, often more, up to 9, rather unequal, strongly imbricated, rounded, concave, spreading, white, caducous. Stamens indefinite, adherent to the petals at their base in two rows, filaments flexuose, about half the length of the petals, anthers large, versatile. Ovary small, free, conical, downy, 3-celled, with 3 or 4 pendulous ovules in each cell; styles three, distinct or combined at the base, slender, with simple stigmas. Fruit a smooth, flattened, rounded-trigonous, 3-celled capsule, with a thin, brown, woody pericarp splitting loculicidally. Seed solitary in each cell, as large as a small nut, rounded on the back with usually flattened sides marked by impressions of the abortive ovules, testa hard, smooth, cinnamon brown, brittle, the interior marked with ramifying vessels, hilum large, nearly circular or oval, inner coat thin, pale brown; embryo straight, with large, thick, coalescent, unequal cotyledons, and a very short radicle at the hilum; no endosperm.

Habitat.—It is considered probable that the Tea-plant is really native in Upper Assam, and that it was introduced into China in very early times from India. Its cultivation on an immense scale is now carried on in China, several parts of India (especially Assam), Japan, Java, and the Southern United States. All botanists are now agreed that the various kinds of tea are the product of a single species, nor does it appear to vary so much as was formerly supposed. In the case of a plant so long under cultivation, a considerable range of form is to be expected. The cultivated races have in many cases a much more stunted habit than the Assam plant, with knotty branches, and the leaves frequently much smaller ($\frac{3}{4}$ inch long or even less), thicker and more obtuse.

As regards *Thea* as a genus distinct from *Camellia,* Seemann was of opinion that they could be separated by the staminal arrangement, but more recent writers have failed to find this constant, and the persistent sepals and nodding flowers alone are insufficient distinctions for generic definition. Seemann described five species under *Thea* besides the Tea of commerce. Baillon keeps the name *Thea* instead of *Camellia* for the combined genera.

Well-grown plants are very ornamental, and are common in botanic gardens; the shrub was introduced in 1768. The flowers are produced in autumn and winter, but rarely appear here in the open air.

Seemann in Trans. Linn. Soc., xxii, p. 349; Fl. Brit. Ind., i, p. 292; Lindl., Fl. Med., p. 349.

Part Used and Name.—THEA, *Tea;* the dried leaves. To distinguish it from other Teas it is also called China Tea. It is not official in either the British, Indian, or United States' Pharmacopœia.

Preparation and Kinds of Tea.—There are two well-marked kinds of Tea distinguished as Black and Green, of each of which we have several commercial varieties. Thus, of Black Teas, the best known sorts are, Congou, Souchong, Oolong, Pekoe, and Caper; and of Green Teas—Hyson, Hyson Skin, Young Hyson, Twankay, Imperial, and Gunpowder. Many teas are scented with the flowers of different plants, as those of the orange, rose, jasmine, sweet-scented olive, &c. The finest teas, some of which sell for as much as 50*s.* per lb., are never forwarded to this country, but are consumed by the wealthier classes in China and Russia. It is not within our province to allude to all these varieties of tea, but only to describe generally the differences between black and green tea.

Black and Green Tea.—It was formerly supposed that black and green tea were the produce of distinct plants, but Fortune, Ball, and others, have proved that both kinds are prepared indiscriminately from the same plant, the differences between such teas depending essentially upon their mode of preparation. Thus, *Green Tea* is prepared as follows:—first, the leaves are exposed after they are gathered for from one to two hours to the atmosphere, for the purpose of drying off any superfluous moisture; they are then put for four or five minutes into the roasting-pan, which is heated below with a brisk wood fire, and during which time they are rapidly moved about by the hands of the workmen.

In this heating process they become quite moist and flaccid, and give off at the same time a considerable portion of vapour. They are then removed and placed upon the rolling table, where they are rolled into balls, and during which process they are subjected to great compression with the object of twisting them, and at the same time getting rid of a portion of their moisture. When the leaves have taken the requisite twist they are removed from the rolling table and shaken out upon flat trays; after which they are thrown again into the pan, which is heated by a slow and steady charcoal fire and where they are kept in rapid motion by the workmen, and in about an hour or an hour and a half the leaves are well dried and have assumed a dullish green colour. The leaves are subsequently winnowed and passed through sieves of different sizes to get rid of the dust and other impurities, and then sorted into the different varieties known as hyson, twankay, gunpowder, &c. By this time the colour is more developed, and the finer sorts have become dull blueish-green.

In the preparation of *Black Tea*, the leaves after having been gathered are spread out and allowed to lie exposed to the air for a considerable time, generally about twelve hours; they are then gathered up and tossed about by the workmen until they become soft and flaccid, after which they are thrown in heaps and allowed to lie in this state for an hour or more; they are then put into an iron pan, where they are roasted for about five minutes, and manipulated as green tea under similar circumstances; and then rolled. After being rolled the leaves are shaken out and thinly spread on sieves, and exposed to the air out of doors for about three hours, after which they are put for a second time into the roasting pan for three or four minutes, and then taken out and rolled again as before. The leaves are subsequently placed in a sieve which is put in a basket, and exposed in this manner to the heat of a charcoal fire for five or six minutes; after which they are rolled for the third time and again heated in a similar way for a little while longer, and are finally dried in baskets over a slow charcoal fire, by which their black colour is fully brought out. They are then sifted,

picked, and sorted into the different varieties, as congou, souchong, &c.

The differences, therefore, in the manufacture of green and black tea are most marked, and fully sufficient to account for their differences of colour and other peculiarities. Thus, Green Tea consists of the leaves quickly dried after gathering, so that their colour and other characters are in a great measure preserved; and Black Tea consists of the leaves dried some time after being gathered, and after they have undergone a kind of fermentation, by which their original green colour is changed to black, and other important changes produced. It should be noticed, however, that a great part of the Green Tea which is exported from China, and consumed in this country and in Europe generally, and also in America, is coloured artificially with a mixture of Prussian blue and gypsum, or indigo and gypsum, to which a little turmeric is sometimes added. Both black and green teas are also frequently adulterated with the leaves of different plants, and in other ways, but the consideration of this subject does not come within our province.

Commerce and Consumption.—The great tea-producing country is China, where it is said four millions of acres of ground are devoted to its cultivation, and the produce annually is estimated at nearly three thousand millions of pounds. Tea is also largely produced in Japan, Java, Assam, and other countries. In India it is also now becoming an important article of commerce; thus, in 1873 the total produce was over 20,000,000 lbs., and the value of tea exported from Calcutta was £1,692,699.

The consumption of tea in all parts of the world must be enormous, as it is more or less partaken of by probably six hundred millions of persons, or about one half of the whole human race. In the United Kingdom the consumption of tea has very much increased of late years. Thus, in 1840 it was about 50,000,000 lbs., in 1856 it was 63,000,000 lbs., in 1867 more than 100,000,000 lbs., while in 1873 it amounted to over 132,000,000 lbs., and it is yearly increasing.

General Characters and Composition.—The different varieties

vol. iv, p. 37, vol. x, p. 618, and vol. xv, p. 112; Amer. Jl. Med. Sci., April, 1868, p. 525, and Oct., 1868, p. 260.

DESCRIPTION OF PLATE.

Drawn from a plant in cultivation at the Royal Gardens, Kew, in flower in January.

1. A young shoot with flowers.
2. A petal with the adherent stamens.
3. Attachment of stamens to petal.
4. An anther.
5. Vertical, and—6. Transverse section of ovary.
7. Fruit.
8. Seed.
9. Section of the same.

(2–6 enlarged.)

D Blair ad vivum del.et lith

M & N Hanhart imp

ALTHÆA OFFICINALIS, *L.*

N. Ord. Malvaceæ. Lindl., Veg. K., p. 368; Baill., Hist. Pl., iv; Le Maout & Dec., p. 279.

Tribe *Malveæ*.

Genus Althæa,* *Linn.* B. & H., Gen., i, p. 200; Baill., l. c., p. 138. About 12 species, natives of the temperate and warmer regions of the northern hemisphere.

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35. Althæa officinalis, *Linn., Sp. Pl. ed.* i, *p.* 686 (1753).

Marsh Mallow.

Figures.—Woodville, t. 198; Hayne, ii, t. 25; Steph. & Ch., t. 51; Nees, t. 417; Berg & Sch., t. 21 f; Syme, E. Bot., ii, t. 278.

Description.—A perennial herb with numerous stems springing from a large, thick, elongated, tough, fleshy, yellowish-white, tapering root-stock, reaching a foot in length. Stems erect, stiff, 2—4 feet high, unbranched or nearly so, cylindrical, covered with a very dense, velvety pubescence of stellate hairs. Leaves alternate on rather long stalks, 1½—3 inches long, the lower ones roundish-ovate, the upper triangular-oval, or somewhat 3- or 5-lobed, irregularly cut, acute, serrate, rather thick, plaited, velvety on both sides with a close felt-like pubescence, and some longer hairs on the veins, pale greyish-green; stipules narrowly triangular, quickly caducous. Flowers in small axillary clusters of 2—4 or solitary, shortly stalked, forming at the end of the stem narrow leafy panicles. Involucre (epicalyx) with 7—10 subulate-triangular erect segments. Calyx deeply divided into 5 narrowly triangular acute segments, about twice the length of the involucre, densely pubescent, persistent. Corolla cup-shaped, varying from 1 to 2 inches across, of 5 obcordate wedge-shaped and truncate petals coherent by their narrow bases, pale purplish-rose-coloured, finely veined, twisted in the bud. Stamens numerous, monadelphous, the filaments combined in their lower portion to form a thick hollow tube, united at the base with the corolla, anthers drooping,

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* Althæa, ἀλθαία, Dioscorides, from ἄλθειν, to heal.

reniform, 1-celled, dark purple, flat after dehiscence. Ovary covered by the base of the combined petals and staminal tube, roundish, flattened, with numerous cells, and a single ovule in each, style cylindrical, tapering, passing through the staminal tube, and dividing beyond it into numerous slender filiform branches with the stigmatic surfaces on the inside. Fruit brownish-green, flattened-spherical, partially covered by the closely inflexed persistent sepals, consisting of a radiating whorl of numerous dry, laterally compressed, circular, indehiscent carpels (cocci) attached to a central axis, smooth on the flat sides, hairy on the back, separating from each other when ripe. Seed kidney-shaped, smooth, brown; embryo curved, with thin cotyledons, endosperm almost absent.

Habitat.—The marsh mallow grows in ditches and wet places in the neighbourhood of the sea and tidal rivers throughout Europe, with the exception of Scandinavia and North Russia; also in Asia Minor, Western Asia (reaching Kashmir), and Algeria. In England it can be scarcely called common, but is to be found in most of the southern counties in suitable situations. Further north in this country it is considered to be introduced or escaped from cultivation, as is also the case in Norway and in the United States. It grows very readily in inland gardens, but loses there a good deal of the characteristic grey velvet-like covering and becomes greener. For medicinal use it is cultivated chiefly in Bavaria and Wurtemberg.

Syme, E. Bot., ii, p. 163; Hook. f., Stud. Fl., p. 71; Watson, Comp. Cyb. Brit., p. 128; Fl. Brit. India, i, p. 319; Boissier, Fl. Orient., i, p. 428; Gren. & Godr., Fl. France, i, 494; Lindl., Fl. Med., p. 143.

Official Part and Name.—ALTHÆA; the root (U. S. P.). Not official in the British Pharmacopœia, or the Pharmacopœia of India.

Collection.—Marsh mallow roots are usually collected in the autumn from cultivated plants of two years old; they are then scraped so as to remove the outer portions of the bark and the

small root branches; and are finally dried, in which condition they are commonly found in commerce. Sometimes the roots are simply washed, after which their branches are removed, and they are then dried without being scraped; but the former mode of preparation is generally preferred.

General Characters and Composition.—Marsh mallow root as prepared by scraping, is in straight, somewhat cylindrical or tapering, unbranched pieces, from about 6 to 8 inches long, and varying in thickness from that of a quill to the middle finger. It has a whitish colour externally, is deeply furrowed longitudinally, and its surface is covered by short soft projecting fibres. When cut transversely it is seen to consist of a central white woody column, which is separated by a dark wavy ring from a thick bark. The central portion breaks short, but the bark has a tough fibrous fracture. It has a feeble peculiar odour, and a mild, mucilaginous, somewhat sweetish taste.

The *unscraped root* has a yellowish-brown colour externally, and its surface is not covered with fibres; but in other respects its characters are essentially the same as those of the scraped root.

The principal constituents of marsh mallow root are *mucilage, starch, sugar,* and a neutral inert crystalline substance, called *asparagin,* which is found in various other plants besides the marsh mallow, as the asparagus, liquorice, &c. Its medical properties are essentially due to the mucilage.

Medical Properties and Uses.—Marsh mallow root is demulcent and emollient. It is but little used in this country, but on the continent it is a very favourite remedy. It is employed internally as a demulcent in inflammatory affections of the alimentary canal, and of the pulmonary and urinary organs; and externally as an emollient poultice and fomentation to inflammatory and abraded surfaces, &c. A favourite preparation in France is the *pâte de guimauve.* In France the powdered root is also much used in the preparation of pills, &c.

Per. Mat. Med., vol. ii, pt. 2, p. 555; Pharmacographia, p. 85; U. S. Disp., by W. & B., p. 97; Journ. de Pharm., vol. xix, p. 208.

DESCRIPTION OF PLATE.

Drawn from a plant cultivated in the garden of the Apothecaries' Company at Chelsea.

1. A plant, reduced.
2. Upper part of a flowering stem.
3. Vertical section of a flower.
4. Calyx and involucre.
5. Ripe fruit.
7. Seed.
8. Section of the same.

(3, 4, 6–8 enlarged.)

D.Blair FLS ad nat del et lith

HIBISCUS ESCULENTUS, *Linn.*

M&N Hanhart imp

N. Ord. MALVACEÆ.

Tribe *Hibisceæ.*

Genus Hibiscus,* *Linn.* B. & H., Gen., i, p. 207; Baill., Hist. Pl., iv, p. 91. A large genus of nearly 200 species, principally tropical, and natives of both the Old and New Worlds.

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36. Hibiscus esculentus, *Linn., Sp. Plant., ed.* 1, *p.* 296 (1753).

Okra, Gombo (West Indies). *Bamia* (Persia &c.).

Syn.—H. longifolius, *Roxb.* Abelmoschus esculentus, *Guill & Perr.*

Figures.—Tussac, Fl. Antilles, i, t. 10; Cav., Diss., iii, 61, fig. 2.

Description.—A large annual herb, reaching 5 or 6 feet in height, stem thick and occasionally somewhat ligneous at the base, erect, stiff, cylindrical, rough with long spreading hairs, sparingly branched, the branches short, readily disarticulating from the stem. Leaves numerous, spreading, alternate, on very long hispid petioles, stipules linear-subulate, hairy, deciduous, blade large, variable in size, often reaching 8 inches or more in length, palmately veined, and more or less deeply cut into 3 or 5 acute lobes or segments which are broad and shallow in the lower ones and deep and narrow in the upper, cordate or rounded at the base, coarsely dentate-serrate, rough with short hairs on both surfaces, pale green. Flowers large, often reaching 4 inches in diameter, solitary in the leaf-axils, on short, thick, hispid peduncles much dilated at the summit; epicalyx of 8—12 linear, acute, erect, strongly hairy bracts which are quickly caducous, buds conical, apiculate. Calyx pale green, soft, densely covered with short hairs, splitting completely down one side at the expansion of the flower and then having the appearance of a small spathe, soon separating by a circular fission from the receptacle and falling away. Petals 5, large, strongly convolute in the bud, much overlapping, slightly connected at the base, delicate in texture, pale yellow,

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* *Hibiscus*, ἰβίσκος, a synonym of *althæa* in the classical writers.

with a purple base within. Stamens numerous, the filaments combined into a short tube and adherent to the petals at the base; anthers covering the upper portion of the tube, crowded, 1-celled, yellow. Ovary ovate, conical, strongly hairy, 4- or 5-celled, style passing through the staminal tube, stigma capitate, large, deeply 4- or 5-lobed, bright crimson. Fruit a capsule, varying in length from 3—10 inches, narrowly oblong or fusiform, tapering to the blunt point, cylindrical, with 4 to 10 blunt angles, rough with short scattered hairs, pericarp dry, chartaceous, yellowish, dehiscing loculicidally into 8—10 valves, 4—5-, or 8—10-celled, with thin dissepiments and a single row of seeds in each cell. Seeds as large as peas, nearly round, testa smooth, brown, thin, embryo curved, cotyledons not folded, radicle inferior, no endosperm.

Habitat.—This is one of that group of plants, now in general cultivation over the tropical world, the native country of which it has become almost impossible to trace. It, like many other Malvaceous plants, establishes itself with great facility, and occurs spontaneously in countries where it is in cultivation. The balance of evidence goes to indicate it as a native of the Old World, as it appears to have been known in Egypt before the discovery of America. Some part of Africa seems to be probably its original home. At the present day it is very much cultivated throughout India, and all tropical and subtropical Asia; on the west coast of Africa it grows everywhere, both cultivated and as a spontaneous weed, and is perhaps a native there. In the West Indian islands the okra is much grown, as well as in tropical and warm parts of America generally, where it must have been introduced at a very short period after the discovery of that continent. In Egypt, Syria, Greece, and other parts of the Mediterranean region, the plant is also cultivated. Of late years it has been cultivated largely in the neighbourhood of Constantinople, and more recently in Algeria.

The plant varies in the size of the flowers and the dimensions, shape, and number of cells of the fruit. It was in cultivation a few years ago at the Regent's Park Botanic Gardens.

Abelmoschus, considered by many botanists to be a valid genus,

contains, besides the present one, about a dozen species. It is distinguished from *Hibiscus* by its long, spathaceous, caducous calyx and fusiform fruit.

Roxb., Fl. Indica, iii, p. 210; Hook. f., Fl. Brit. Ind., i, p. 343; Fl. Trop. Africa, i, p. 207; Grisebach, Fl. Br. W. Indies, p. 84; Lindl., Fl. Med., p. 144; Flück. & Hanb., Pharm., p. 86; DC. Géogr. Bot., p. 768.

Official Part and Names.—Hibisci Capsulæ; the fresh immature capsules (I. P.). They are not official in the British Pharmacopœia, or the Pharmacopœia of the United States. In the East and West Indies, and other parts of the globe, where the plant is extensively cultivated for the sake of its fruit and other purposes, both it and the fruit are known under various names, as *Okro, Okra, Gombo, Bendikai,* &c.

General Characters and Composition.—The official description of these capsules in the Pharmacopœia of India is as follows:—"From 4 to 6 inches in length, about an inch in diameter at the base, tapering, furrowed; somewhat bristly, particularly at the ridges, which correspond in number with that of the cells and valves, viz. from five to eight, with a single row of smooth round seeds in each cell; abounding in a copious bland viscid mucilage." When fresh the capsules have a green colour, and a weak herbaceous odour. Although the Pharmacopœia of India orders the use of the fresh immature capsules; it is afterwards stated, that the dried capsules may be employed when they are not procurable in a fresh state.

The leaves and roots also contain a similar mucilage to the capsules, more especially the roots; these are from one to two feet in length, and are said to yield twice as much mucilage in proportion to weight as marshmallow root. Their powder is also described as superior to that of marshmallow root.

The essential constituent of these capsules is *mucilage,* which is supposed to be of the same nature as that of marshmallow root, but it has never been thoroughly examined. It has been termed *gombine.* The green fruits, examined by Popp, in Egypt, were found to abound in *mucilage, pectin,* and *starch;* and when dried

GOSSYPIUM BARBADENSE. *Linn.*

N. Ord. Malvaceæ.

Tribe *Hibisceæ*.

Genus Gossypium,* *Linn.* B. & H. Gen., i, p. 209; Baill., Hist. Pl., iv, p. 149. Species about 6 or 8 (many more have been distinguished), natives of hot countries in both Worlds.

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37. Gossypium barbadense, *Linn., Sp. Plant., ed.* 1, *p.* 693 (1753).

Cotton. Sea Island Cotton.

Syn.—G. vitifolium, *Lam.* G. peruvianum, *DC.* G. punctatum, *Schum. & Thonn.* G. acuminatum, *Roxb.* G. religiosum, *Parl.* non *Linn.*

Figures.—Wight, Illust. Ind. Bot., t. 27 (*G. acuminatum*) & t. 28; Parlatore, Sp. Cottoni, t. 3 & (*G. religiosum*) t. 4.

Description.—A small shrub or large herb, erect, reaching 9 or 10 feet in height, with many widely spreading branches; stem stiff, cylindrical, solid, smooth or pubescent, somewhat striate, purplish or green, sprinkled with numerous small, raised, black, dot-like glands. Leaves alternate, numerous, spreading, on stiff round petioles about or nearly equalling the blade, and covered with similar black dots to those on the stem; stipules rather large, linear-lanceolate, the upper ones falcate, usually soon deciduous; blade 3—6 inches long, and about as wide, cordate at the base, palmately cut about half way or more down into 3 or 5 acuminate entire lobes, or the lower ones ovate, entire, usually covered with deciduous stellate down when young, when mature glabrous on both surfaces, bright green above, paler beneath and with 3 prominent veins, on the centre one of which near its base is a prominent oblong gland. Flowers large, 3—4 inches in diameter, on stout, spreading, stiff angular pedicels opposite the leaves (really terminal), somewhat thickened upwards and sprinkled with prominent black glands; epicalyx of three very large bracts about 2 inches long, cordate and entire at the base,

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* *Gossypion* and *Xylon* are the names in Pliny for a shrub growing in Upper Egypt, in all probability a cotton.

deeply laciniate with numerous large attenuated somewhat falcate teeth, glabrous, green, ribbed with veins, dotted with glands. Calyx small, about ½ inch long, entirely concealed by the bracts, tubular-campanulate, truncate or faintly 5-lobed at the margin, glabrous, parallel-veined and gland-dotted. Petals 5, strongly convolute in æstivation, spreading but much overlapping, slightly connected to form a very short tube at the base, longer than the bracts, 2½—3 inches, irregularly obovate-truncate, wedge-shaped at the base, very unequal-sided, pilose externally, finely veined and sprinkled with minute black dots, bright sulphur yellow with a crimson blotch near the base, or pale vinous red. Stamens numerous, united to form a long tube, which is fused with the base of the petals below, and is covered with small round or reniform 1-celled yellow anthers on slender filaments. Ovary conical, smooth, dotted, 3- to 5-celled, with numerous ovules; style simple, passing through the staminal tube and projecting beyond its mouth; stigma clavate, slightly 3—5-lobed. Fruit an ovate-ovoid acute or acuminate capsule, 1½—2 inches long, surrounded and inclosed by the persistent bracts of the epicalyx, smooth, dark brown, loculicidally dehiscent into 3—5 valves. Seeds numerous, closely packed, but usually easily separable from one another, irregularly ovoid; testa dark brown, rather thick, hard, entirely covered with very numerous long, very delicate, simple, pure white, flexuous hairs about 1 inch long, which are readily removed from the testa and leave a smooth bare surface; embryo completely filling the seed, dotted with small black sunk glands; radicle short, clavate, cotyledons large, much doubled and folded; no endosperm.

Habitat.—It is probable that this species of cotton is, as its name indicates, a native of the West Indies; this cannot, however, be stated with complete certainty. Its culture is now spread over a large part of the warmer regions of the globe, and under one or other of its forms it is very largely grown in the West Indies, the Southern United States, Central and S. America, tropical and North Africa, the hot parts of Australia, and even the south of Spain. It affords the best long staple cottons of com-

merce; Sea Island, Kidney, Peruvian, Brazil, Bahia, &c., being the produce of different varieties. It is the clean separation of the long hairs from the seed which especially gives this species its value, but this character appears not to hold good in all its varieties. The plant has become naturalised in Western Tropical Africa, and then becomes much more hairy; but Dr. Welwitsch was convinced it was nowhere truly wild there, the only native species being the very distinct *G. anomalum*, W. & P., which also occurs in Nubia.

Cotton is afforded by the other species of the genus, of which by far the most important is *G. herbaceum*, Linn. This differs from *G. barbadense* in its smaller size, less divided leaves and bracts, smaller petals and fewer seeds from which the cotton hairs do not readily separate and which have a short downy covering on the testa. Figures of this species are given in Wight, Icones Fl. Ind. Or., tt. 9 & 11, Royle, Illust. Himalayan Bot., t. 23, fig. 1, & Parlatore, Sp. Cott., t. 2; it furnishes the Indian cottons known as Dacca, Behar, Nankin (with yellow or brownish hairs), &c. There can be little doubt that this is native to Central Asia and India (Masters suggests *G. Stocksii*, Mast., of Sind, as the parent form), whence its culture spread westward to Arabia and Upper Egypt in very early times,* and eastward into China apparently about the ninth or tenth century. Under a great variety of forms it is at the present time grown throughout the warmer regions of the old world, and, though to a far less extent, also in America. The Moors brought the plant into Spain in the sixteenth century, and, as it is a hardier species than *G. barbadense*, it can be grown in Southern Italy up to 42° N., thus excluding Tuscany.

The other species cultivated for cotton is *G. arboreum*, Linn.,

* Yet it is certain that the ancient Egyptians were unacquainted with cotton. No cotton has ever been detected in the cloths of their mummies (which are always linen); no seeds have been found in the tombs, nor is the plant represented in the Egyptian paintings. It is worth remark that, on the contrary, the uses of cotton were well known in Peru at a period long anterior to the discovery of the New World, and the mummy-cloths of that country are composed of this material.

which is grown in the tropics but not to a very great extent. It is distinguished by its nearly entire bracts and purple flowers. There are figures in Wight, Icones, t. 10, and Parlatore, l. c., t. 1.

It must be stated that the species of this genus are very ill-defined and in considerable confusion, and that the above account represents the views of those botanists who are disposed to combine the numerous species which have been proposed.

Many cotton plants are grown in botanic and other gardens here; the present species was introduced by Miller in 1759. The apparent position of the flowers opposite the leaves is due to the axillary branches growing on and continuing the direction of the stem. In most books the flowers are incorrectly described as axillary.

Roxburgh, Fl. Indica, iii, p. 187; Masters, in Fl. Trop. Africa, i, p. 210, and in Fl. Brit. India, i, p. 347; Grisebach, Fl. Brit. W. Indies, p. 86; Seemann, Fl. Vitiensis, p. 21; DC., Géographie Botanique, p. 971; Irving, in Hook. Journ. Bot., 1855, p. 297; Parlatore, Specie dei Cottoni (1866), p. 48.

Official Parts and Names.—Gossypium; the hairs of the seed of various species of Gossypium, carded (B. P.). The hairs of the seeds of the different species of Gossypium (I. P.). 1. Gossypium; a filamentous substance separated from the seed of Gossypium herbaceum, and of other species of Gossypium: 2. Gossypii Radicis Cortex; the bark of the root of Gossypium herbaceum, and of other species of Gossypium (U. S. P.).

1. Gossypium.—*General Characters.*—The filamentous substance, called *cotton*, or incorrectly, in the British Pharmacopœia, *cotton wool*, consists of tubular cells, forming the hairs which arise from the surface of the seed-coat, in the various species of Gossypium. In its unprepared state it is termed *raw cotton*. Cotton may be readily distinguished under the microscope from liber-cells, such as those forming flax fibres, from its component cells not possessing any stiff thickening layers in their interior and thus collapsing when dry, so that it then resembles a more or less twisted band with thickened rounded edges; while flax fibres

from containing thickening layers, always maintain their original cylindrical form, and taper to a point at each end.

Composition.—Cotton consists of nearly pure cellulose associated with only 1 to 1½ per cent. of inorganic matter. It is insoluble in water, alcohol, ether, the oils, and vegetable acids; it is soluble in strong alkaline solutions; and is decomposed by the concentrated mineral acids. By the action of nitric acid, or of a mixture of nitric and sulphuric acids, it is converted into the explosive substance known as *Gun Cotton*, which is official under the name of *Pyroxylin*, and is directed in the British Pharmacopœia and the Pharmacopœia of India, to be prepared by immersing cotton in a mixture of sulphuric and nitric acids. Pyroxylin or Gun Cotton is readily soluble in a mixture of ether and rectified spirit, and in this way the official *Collodium* or *Collodion* is prepared. The official preparation known as *Flexible Collodion* is made by adding a little Canada Balsam and Castor Oil to the ordinary collodion.

Medical Properties and Uses.—Cotton is used as an application to burns and scalds. In such cases it allays pain, diminishes the inflammation, and much hastens the cure; its effects being chiefly due to the absorption of effused fluids, and by protecting the surface from the air, and maintaining it at an equable temperature. Cotton may also be employed as an application to blisters, and in erysipelas. "Cotton is also usefully employed to surround joints inflamed with gout; it should then be completely covered with oil-silk or gutta-percha tissue, so as to keep the affected parts in a kind of vapour bath." Cotton is sometimes used to arrest hæmorrhage, its action in such cases being simply mechanical; but of late years a substance called "styptic cotton" has been employed in the United States as an adjunct to arrest passive hæmorrhage from extensive surfaces. This may be prepared either by boiling cotton in a weak solution of soda (4 per cent.), for an hour, then washing, drying, and steeping it in solution of sulphate of iron (diluted one third), and drying it again; or by boiling cotton in solution of alum and gum benzoin, drying the cotton so prepared, and after picking, saturating it with per-

chloride of iron. As a dressing for wounds and ulcers, cotton and cotton lint are generally considered inferior to linen and flax lint. Thus Erasmus Wilson says, "that he attributes the softness and smoothness of linen to the roundness and pliability of its fibre; the cold feeling to its being a good conductor of heat, the porosity of its fibre rendering it very attractive of moisture, absorbing it freely, which, as water is a conductor of heat, removes it rapidly from the body." On the contrary, "cotton is a bad conductor of heat; it does not absorb moisture to conduct the heat away. It wants the freshness of linen; it is not, like linen, composed of fibres which are perfectly rounded, but, on the contrary, its fibres are flat and have sharp edges, which are apt in delicate skins to excite irritation. It is on this account that we carefully avoid the application of cotton to a graze or wound, and employ for such a purpose its softer and smoother rival linen." Cotton has not, however, as we have seen, sharp edges, but thickened rounded ones, so that the explanation thus given cannot be entirely correct; nevertheless most persons maintain the superiority of linen over flax as a surgical dressing. It has been suggested by Stoddart, that independently of its being a bad conductor of heat, the fibres of cotton twist when wetted by the moisture from a wound, and thus cause irritation.

The preparations known as Collodion and Flexible Collodion are applied to many uses in Medicine and Surgery. Their properties are essentially due to their drying rapidly when exposed to the air, owing to the evaporation of their ether, and thus leaving a thin transparent film; and in the case of the flexible collodion, as its name implies, the film is flexible and does not crack or split with the movement of the part to which it has been applied. Collodion is extensively used as a local application to incised wounds, ulcers, erysipelas; in skin diseases, as smallpox, &c.; chapped hands, chapped nipples, fissures of the lips, fissures of the anus, &c.; also to arrest hæmorrhage from leech bites, &c., and in many other cases where the surface is cut and inflamed, &c.

Other Uses of Cotton.—The uses of cotton as a medicinal agent

are, however, comparatively small; its great consumption being for other purposes. These, however, can only be very briefly alluded to by us. Thus it is now very largely employed in the preparation of the explosive material termed *Gun Cotton*, which has been already referred to as being official under the name of Pyroxylin, and its medical properties and uses have been also described under its official preparations *Collodium* and *Collodium flexile*. Gun cotton owes, however, its chief value in its application to Gunnery and other Military Purposes, and for Blasting, &c. But it is for manufacturing purposes that cotton is essentially used. This may be judged of by the fact that, in 1873, about 1,532,616,000 lbs. of cotton were imported into Great Britain alone, and its consumption at the present time by the whole manufacturing world is probably not less than 3,000,000,000 lbs. For inner clothing cotton fabrics are preferable to linen, because, from their being bad conductors of heat, they preserve the body from sudden changes of temperature; while linen, from being a good conductor of heat, when the skin is covered with perspiration, or exposed to cold, feels chilly.

Other Uses of Cotton Seeds.—Cotton seeds after the cotton has been separated from them, when submitted to pressure, yield a fixed oil, which is known as Cotton Seed Oil. Before submitting the seeds to pressure, they are divested of their coats; and in this state they yield about two gallons of crude oil to the bushel, and forty-five per cent. of oil-cake. Several varieties of this oil are known in the Southern States of America, of different degrees of purity. The purest has been described as of a pale straw colour, a mild peculiar odour, and a bland sweetish taste, not unlike that of almond oil. It is said to be a drying oil, but Weatherby throws doubt on this property. It has been employed for burning, and is stated to be largely used in the United States in the preparation of woollen cloth and morocco leather, and also for oiling machinery and other purposes. It is also said to be an excellent substitute for olive and almond oil in most of the pharmaceutical preparations in which these oils are now used; it has also been employed in place of olive oil for eating purposes, and for making soap. It is likewise stated to be largely

employed for adulterating olive oil. The average annual imports into this country now amount to nearly 100,000 tons. The cake left after the expression of the oil is employed for feeding cattle.

A decoction of cotton seeds has been used in the Southern States, it is said with marked success, as a remedy in intermittents.

Per Mat. Med., by B. & R., p. 921; U. S. Disp., by W. & B., pp. 436, 1085, & 1370; Bentl., Man. Bot., 3rd ed., p. 435; Watts' Dict. Chem., vol. iv, p. 776, and vol. ii, p. 91; Garr., Mat. Med., p. 215; Pharm. Journ., vol. iii, ser. 1, p. 351, and vol. x, p. 243; Greenish, in Pharm. Journ., ser. 3, vol. i, p. 352, with figures of cotton and flax; Watson, Proc. Amer. Pharm. Assoc., vol. x (1862), p. 237; Weatherby, Pharm. Journ., ser. 2, p. 30, from Amer. Journ. Pharm., May, 1861, p. 208; Reynolds, in Pharm. Journ., ser. 2, vol. vii, p. 226; Proc. Amer. Pharm. Assoc., vol. xxi (1873), pp. 145 and 198.

2. Gossypii Radicis Cortex.—Cotton root bark was first introduced into the last revision of the Pharmacopœia of the United States, in 1875, but it had long been regarded as an excellent emmenagogue.

General Characters.—It is described by Professor Maisch as follows :—from "about half a line to one line in thickness, rarely thicker. Externally, the bark is a brownish-yellow colour, with larger irregular patches of a brownish-orange caused by the abrasion of the outer layer of cork; and smaller ones, more scattered, of a nearly black colour. The yellowish portion has a slight satiny lustre; the other parts are dull. The thin corky layer, which adheres well to the bark layer, forms shallow longitudinal ridges, often becoming confluent into narrow elongated meshes. Suberous warts, or their scars, are scattered over the surface, at first circular in shape, ultimately forming short transverse black lines. The inner surface is of a whitish or reddish-white colour, a silky lustre, and finely, but to the naked eye, distinctly striate in a longitudinal direction. The bark fibres are long and tough, and arranged in tangential rows, on account of which the inner bark may be separated into very thin, almost transparent layers without difficulty. The bark is without odour, and possesses scarcely an acrid taste;

the corky layer is in the main rather feebly astringent." Professor Maisch has also described a spurious cotton-root bark, which he supposes to be derived from some species of *Populus*. Maisch also states that he believes that a considerable portion of the commercial fluid extracts of cotton-root bark have been made from this spurious bark, "and the question therefore presents itself, to which cotton-bark the reputed emmenagogue properties must be ascribed." "The false bark is thicker and more brittle than the genuine; it breaks transversely with little difficulty. The interior surface is of a dark brown or blackish colour, while that of the true bark has a whitish or reddish-white colour with a silky lustre."

Composition.—Cotton-root bark has been analysed by Wayne and W. C. Staehle. Its chief constituent would appear to be a *resin*. No alkaloid was found in the bark.

Medical Properties and Uses.—Cotton-root bark is regarded as an excellent emmenagogue. It has been largely used in the Southern States instead of ergot of rye to promote uterine contraction. It is also said to be very serviceable in dysmenorrhœa and scanty menstruation, and particularly in suppression of the menses by cold.

U. S. Disp., by W. & B., p. 437; Stillé's Therap. and Mat. Med., vol. ii, p. 602; Weatherby, in Pharm. Journ., vol. iii, ser. 2, p. 30, from Amer. Journ. Pharm., May, 1861, p. 208; Wayne, Amer. Journ. Pharm., 1872, p. 291, and Proc. Amer. Pharm. Assoc., vol. xxi (1873), p. 234; Maisch., in Amer. Journ. Pharm., Jan., 1875, p. 11, and Proc. Amer. Pharm. Assoc., vol. xxiii (1875), pp. 193 and 500; Staehle, in Amer. Journ. Pharm., October, 1875, p. 457, and Proc. Amer. Pharm. Assoc., vol. xxiv (1876), p. 166.

DESCRIPTION OF PLATE.

Chiefly drawn from a specimen in the British Museum from Jamaica.

1. A branch, with flowers.
2. The calyx.
3. Ripe capsule after dehiscence.
4. A seed.
5. The same deprived of its hairs.
6. Vertical section of the same.

(6 enlarged)

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6
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THEOBROMA CACAO *Linn.*

N. Ord. Sterculiaceæ. Le Maout & Dec., p. 283.

Tribe *Byttneriaceæ*. Lindl., Veg. K., p. 363 (N. Ord.); Baill., Hist. Pl. iv, p. 75.

Genus Theobroma, *Linn.** B. & H., Gen., i, p. 225; Baill., l. c., p. 77; Bernoulli in Nouv. Mém. de la Soc. Helvet. des Sc. Nat., vol. xxiv (1871). Species about 8, natives of tropical America.

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38. Theobroma Cacao *Linn., Sp. Pl. ed.* 1, *p.* 782 (1753).

Cacao. Cocoa or Chocolate Tree.

Syn.—Cacao sativa, *Lam.* C. Theobroma, *Tussac.* C. minus, *Gaertn.*

Figures.—Nees, t. 419; Tussac, Fl. Antilles, i, t. 13, cop. in Hayne, ix, t. 35; Berg & Sch., t. 33 e & f; Sloane, Hist. Jamaica, t. 160; Bernoulli, l. c., t. 1 & 2.

Description.—A tree of no great size, with round branches covered with a smooth greyish bark. Leaves alternate, stalked, 8 or 9 inches long by 2½ wide or even larger, ovate-lanceolate or ovate-oblong, acute, rounded at the base, entire, veins prominent beneath; petiole 1 inch long, thickened at both ends; stipules caulinary, subulate-linear, acutely serrate, young leaves pink. Flowers on delicate, pubescent, articulated, often branched stalks, in clusters from the old wood of the branches and trunk, occupying the position of former leaf-axils. Calyx very deeply 5-cleft, divisions ovate-acuminate, pale red, membranous, woolly on the edge. Petals 5, alternating with the calyx-segments, the lower half erect, hood-shaped, pale-pink, marked on the inside with two crimson prominent nerves, the upper half spreading, spathulate, on a filiform stalk, lemon-yellow. Androœcium forming at its base a hypogynous tube surrounding the ovary, and consisting of 5 stamens opposite the petals, which are bent outwards and received into the cucullate bases of the latter, and, alternating with these, 5 elongated linear processes (staminodes), which stand erect, and are of a brilliant crimson; filaments short, anthers small, green, extrorse, each consisting of 4 cells arranged crosswise (2 anthers combined ?). Ovary small, sessile, pen-

* Name from Θεός, a god, and βρῶμα, food.

tagonous, pilose, 5-celled; style tapering, a little longer than the stamens, dividing into 5 short branches at the summit; ovules numerous, placentation axile. Fruit pendulous, solitary or two or three together, large, 6 or 7 inches long, of an elongated pyriform shape, tapering at the end, marked with (usually) 10 shallow furrows and blunt ridges, surface more or less tubercular, at first yellow, afterwards red or purple, pericarp thick, tough, inner portion harder; 5-celled. Seeds numerous and closely packed in tiers in each cell, about the size of almonds, but more irregular in form from mutual pressure, immersed in copious sweet buttery pulp; seed-coats two, the outer membranous, veined; cotyledons large, thick, irregularly crumpled and divided, with a process of the inner seed-coat passing into each fissure, radicle conical, indistinct, endosperm wanting.

Habitat.—The chocolate tree is a native of parts of Brazil and other northern portions of South America, extending also into Central America as far north as Mexico. It is extensively cultivated throughout the tropics of both the new and old worlds, especially in some of the West Indian Islands. Examples may be seen here in the hot-houses of several botanic gardens, the tree having been introduced in 1759. There are several varieties or races in cultivation

DC. Prod., i, p. 484; Triana & Planch., Fl. Nov. Granat., p. 208; Humb., Bonpl. & Kunth, v, p. 316; Sloane, Jamaica, ii, p. 15; Griesbach, Fl. W. Ind., p. 91; Lindl., Med. Bot., p. 138.

Official Part and Name.—Oleum Theobromæ. A concrete oil obtained by expression and heat from the ground seeds (B. P.). A concrete oil (*Theobromæ Oleum*) obtained by expression and heat from the ground seeds (I. P.). Oleum Theobromæ. The concrete oil of the kernels of the fruit (U. S. P.).

Production.—Oil of Theobroma, or, as it is commonly termed, Cacao butter, is generally obtained from the Chocolate manufacturers, who procure it by submitting the warmed seeds to pressure. The kernels of cocoa seeds yield on an average about half their weight of oil.

General Description and Composition.—Oil of Theobroma is usually seen in the form of oblong cakes or tablets, weighing about half a pound each. It is a yellowish, opaque, dry substance,

about the consistence of tallow, with a bland agreeable taste, and a pleasant odour resembling chocolate. It breaks readily, and presents a dull waxy fracture. Its sp. gr. is 0·961, and it melts at a temperature of 122° Fahr. It does not become rancid from exposure to the air. Its chief constituent is *stearin*, hence it is one of the best fats for the preparation of stearic acid.

Uses.—Cacao butter has been but lately introduced into the British and United States pharmacopœias, but it has been long used on the Continent. It is peculiarly well adapted from its consistency, blandness, and freedom from rancidity, for the preparation of suppositories, for which purpose it is official. It is also used as a basis for pessaries, as an ingredient in cosmetic ointments, and for coating pills and other purposes.

Cocoa or Cacao Seeds.—The principal use of cocoa seeds is not, however, on account of the concrete oil they yield, but for the preparation of chocolate and cocoa; hence they are sometimes called *chocolate nuts*. Cocoa seeds are principally imported into this country from our West Indian Colonies, and more especially Trinidad and Granada.

Chocolate, which derives its name from the Indian term *chocolat*, is prepared as follows:—The seeds are first roasted, then divested of their husks or shells, and the kernels afterwards crushed between heated stones or rollers, by which they are reduced to a pasty consistence. This paste is then mixed with sugar, and some vanilla or cinnamon added for flavouring, and usually a small quantity of arnatto as a colouring agent, and, finally, it is moulded into cakes. This is essentially the mode of preparation of the finer qualities of chocolate, but the flavouring of the inferior kinds is sometimes produced by adding sassafras nuts, cloves, or some other spice. Chocolate is adulterated in some cases with rice flour, various starches, lard, and other substances.

Cocoa is prepared either by grinding up the roasted seeds with their husks between hot cylinders into a paste, which is then mixed with variable amounts of sugar, starch &c., and formed into *common cocoa, rock cocoa, soluble cocoa*, &c.; or, the roasted seeds, divested of their husks, are broken into small fragments, in which state they form *cocoa nibs*, the purest kind of cocoa.

Both cocoa and chocolate are very largely used for the preparation of agreeable and nutritious beverages; indeed, the generic name *Theobroma* was given to the tree yielding cocoa seeds by Linnæus, to mark his high opinion of the agreeable and valuable properties of the beverages prepared from them, although Belzoni, a traveller of the sixteenth century, regarded them in a very different light, for he declared that cocoa was a drink "fitter for a pig than for a man." Cocoa and chocolate are not such refreshing and stimulating beverages as tea and coffee, but they are much more nutritious in consequence of the large quantity of concrete oil (*Oleum Theobromæ*) they contain, although, from the same cause, they disagree with many persons. To such persons cocoa nibs should be recommended.

Cocoa and chocolate form the common unfermented beverages of about fifty millions of persons in Spain, Italy, France, and Central America, and it has been estimated that more than 100,000,000 lbs. of cocoa seeds are annually consumed in these countries, Spain alone consuming forty millions of pounds. Cocoa is also now largely used in this country, and its consumption has enormously increased of late years. Thus, in 1820 the consumption of cocoa seeds was only 276,321 lbs., in 1860 it had increased to 4,583,124 lbs., while in 1873 it was over eight millions of pounds.

Cocoa seeds owe their properties to the concrete oil already fully described (*Oleum Theobromæ*), and to an alkaloid named *theobromin*, which resembles both *thein* and *caffein*, the alkaloids respectively of tea and coffee, both in its chemical characters and effects. (See Tea and Coffee.)

Per. Mat. Med., by B. and R., p. 920; Pharmacographia, p. 88; U. S. Disp., by W. and B., p. 620; Bentl. Man. Bot., p. 440; Chem. Gaz., Aug. 15, 1854, p. 306; Soc. Arts Jl., March 13, 1874.

DESCRIPTION OF PLATE.

Drawn from a specimen in the tropical house of the Royal Gardens, Kew, flowering in June. The fruit added from a specimen preserved in spirit in the British Museum. 1. Portion of the trunk bearing flowers and foliage. 2. A single flower. 3. A petal. 4. The staminal whorl partly cut away and flattened out. 5. Vertical, and 6, transverse sections of ovary. 7. Fruit. 8. Seed. 9. Embryo. 10. The same, with one cotyledon removed. (2—6 enlarged.)

J. Barbier nat. del. et lith.

LINUM USITATISSIMUM, *Linn*

N. Ord. LINACEÆ. Lindl., Veg. K., p. 485; Le Maout & Dec., p. 293; Baill., Hist., pl. v.

Tribe *Lineæ*.

Genus Linum, *Linn.** B. & H., Gen., i, p. 242; Baill., l. c., p. 42. Species 80 or more, natives of either hemisphere, and chiefly extra-tropical.

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39. Linum usitatissimum, *Linn., Sp. Pl., ed.* 1, *p.* 277 (1753).

Flax. Cultivated Flax.

Figures.—Woodville, t. 202; Steph. & Ch., t. 61; Nees, t. 389; Hayne, viii, t. 17; Berg & Sch., t. 18 e; Curt., Fl. Lond., fasc. 5; Syme, E. B., ii, t. 292; Baillon, l. c., figs. 69—75.

Description.—A stiff, upright annual, about 1—2 feet high; stem usually solitary, cylindrical, quite smooth, green, corymbosely branched in the upper part. Leaves alternate, sessile, linear-lanceolate, attenuate at each end, $\frac{3}{4}$—$1\frac{1}{2}$ inch long, entire, smooth, faintly ribbed. Flowers solitary at the ends of the branches. Sepals 5, imbricate, ovate, with attenuated points; outer ones narrower, strongly 3-nerved, margins broadly membranous. Petals 5, twisted, large, fugaceous, shortly clawed, veined, deep violet-blue, slightly crenate at the margin. Stamens 5, alternate with the petals, the filaments more or less connected into a short tube at the base, with 5 abortive or rudimentary stamens (staminodes) alternating with them; anthers small, versatile, dark blue. Ovary flask-shaped, 5-celled at the base, with a thick axis; ovules 2 in each cell, collateral, attached to the upper part of the axis; styles 5, distinct. Fruit capsular, surrounded at the base by the persistent sepals, globose, with a sharp-pointed apex, smooth, imperfectly 10-celled; pericarp thin, tough, papery, splitting septicidally into its component carpels and partially down the back of each carpel through the spurious partitions formed between the pairs of seeds. Seeds $\frac{1}{4}$—$\frac{1}{6}$ of an inch long, flattened-ovoid, with rounded edges and an oblique blunt beak at the

* *Linum*, the classical name.

upper end; testa bright brown, smooth, shining; embryo green, occupying almost the whole seed, surrounded with a very thin layer of endosperm; cotyledons large, flat; radicle straight, superior.

Habitat.—The native country of the cultivated Flax is impossible to determine, and its cultivation reaches back to the remotest periods of history. It readily escapes, and is found in a quasi-wild condition in all the countries where it is grown, but is nowhere known as truly spontaneous. It is possible, as supposed by Prof. Heer, that it is a cultivated race developed from *L. angustifolium,* Huds., a frequent wild plant in southern and western Europe (including England), the plants known as *L. ambiguum,* Jord., *L. hyemale romanum* and *L. humile,* Mill., being the successive connecting links. De Candolle suggests that more than one species have been in cultivation. The plant cultivated in India is stated to have some characters of *L. humile,* Mill. Flax is now extensively cultivated in both temperate and tropical climates, *e. g.* in Russia, Egypt, throughout India, the United States, the south of Europe, Holland, and England. In this country it frequently occurs by roadsides and in waste ground, but is nowhere permanent.

Syme, E. B., ii, p. 184; Hook. f., Stud. Fl., p. 74; Watson, Comp. Cyb. Br., p. 493; Lowe, Fl. Mad., i, p. 98; Oliv., Fl. Trop. Afr., i, p. 268; Hook. f., Fl. Brit. Ind., i, p. 411; Journal of Botany, 1874, p. 87; Lindley, Fl. Med., p. 129.

Official Parts and Names.—1. Lini Semina; the seeds: 2. Lini Farina; the cake of linseed from which the oil has been pressed, reduced to powder: 3. Oleum Lini; the oil expressed without heat from Linseed (B. P.). The seeds (*Lini Semina*) (I. P.). 1. Linum, *Flaxseed;* the seed: 2. Lini Farina; the meal prepared from the seed: 3. Oleum Lini; the fixed oil obtained from the seed (U. S. P.).

1. Lini Semina.—Linseed is imported into this country in enormous quantities, chiefly from Russia and India, but to some extent also from Germany, Holland, and other countries. Thus, the total value of imports from Russia in 1872 was about

£3,000,000; from India during the same year £1,144,942; and from Germany and Holland £144,108; the total quantity imported being 1,514,947 quarters, representing a money value of £4,513,842. Some seed is also produced in Great Britain, but the cultivation of the flax plant is declining in this country. Several varieties of linseed are known in the markets, and of these English, Calcutta, and Bombay, fetch the highest prices.

General Characters and Composition of Linseed. — Linseed, Lintseed, or Flaxseed, is small, although varying in length from $\frac{1}{4}$—$\frac{1}{6}$ of an inch, the seed from warm countries being the largest. The seeds are more or less flattened, and have a smooth shining surface of a brown colour; internally they are yellowish-white; they have a mucilaginous oily taste, but no odour. The characters of the seed should be carefully noted, as linseed is very much adulterated with rape, mustard, and other seeds, from which it should be carefully separated. In America a variety of flaxseed is met with which has a greenish-yellow instead of the ordinary brown colour. In other respects it does not appear to differ essentially from the common seed.

The principal constituent of linseed is the *fixed oil* (see *Oleum Lini*), which forms about one third of its weight. The other important constituent is a peculiar *mucilage*, which appears to be a product of the transformation of starch, for while starch is found in unripe linseed it is altogether absent from the ripe seed; hence a decoction of linseed does not become blue by the action of iodine, and hence also a means of detecting mealy seeds and cereal grains when mixed with linseed.

Medical Properties and Uses.—Linseed possesses emollient and demulcent properties, and is largely employed in the form of an infusion which is commonly known as *linseed-tea*, in irritation and inflammatory conditions of the mucous membranes generally, as in catarrhs and urinary affections, and in diarrhœa and dysentery. Linseed tea may be made more palatable by the addition of sliced lemon and sugar-candy.

2. Lini Farina.—The *cake* left after the oil has been expressed from linseed is usually called *oil-cake;* this when ground to powder

forms the *linseed meal* of the British Pharmacopœia. In the United States Pharmacopœia the seeds are simply directed to be ground, and the meal, which is there called *flaxseed meal*, consequently differs from that of the British Pharmacopœia in containing the oil. The meal containing the oil is to be preferred when used fresh, but it soon becomes rancid by the formation of fatty acids from the oxidation of the contained oil. Linseed meal is greyish-brown in colour.

Linseed meal is a valuable emollient application. It is very largely used in the form of a poultice to inflamed and suppurating surfaces. It is also employed when mixed with water for luting by chemists. Oil-cake, from containing about 30 per cent. of protein substances, equivalent to 5 per cent. of nitrogen, forms a very valuable food for cattle, for which purpose it is largely employed.

3. Oleum Lini.—Linseed or flaxseed oil is usually obtained on a large scale by first roasting the seeds to destroy the mucilaginous matter contained in their coats, and then submitting them to pressure, when they yield from 20 to 30 per cent. of oil according to the quality of the seed. The best oil is, however, obtained by pressing the seeds without previous heating, but the yield is not so great, averaging less than 20 per cent. under such circumstances. The oil when obtained without heat is of a very pale amber colour, and when fresh has but little taste or odour; but commercial oil is usually of a dark yellowish-brown colour, and has a disagreeable odour and a nauseous acrid taste. Its specific gravity is about 0·932. It is soluble in alcohol, but more readily so in ether, and has the property when exposed to the air of drying into a hard transparent varnish, more especially after having been boiled, and still more after having been heated with oxide of lead. Its essential constituents are *glycerin* and fatty acids, more especially *linoleic acid*, to which it owes its drying property.

Linseed oil is emollient in its action, and is a valuable application to burns or scalds, either alone or mixed with an equal volume of solution of lime (lime-water). This mixture is commonly known

under the name of *Carron Oil.* Linseed oil, however, is principally used in painting, on account of its drying property, and in the manufacture of printers' ink.

4. Other Products of the Flax Plant.—The value of the flax plant is not confined to its seeds, but its *liber-fibres* when properly prepared constitute *flax* of which linen fabrics are made. The consumption of flax for this purpose is enormous; even in this country alone in 1873, besides the flax obtained from home cultivation, we imported 2,194,000 cwt. Linen when scraped forms *lint,* which is so valuable for surgical dressings, and the short fibres which are separated in the course of its preparation constitute *tow,* which is much employed in pharmacy, surgery, and for other purposes.

Per. Mat. Med., by B. & R., p. 924; Pharmacographia, p. 90; U. S. Disp., by W. & B., pp. 528 and 598; Greenish, in Year Book of Pharmacy, 1871, p. 590.

DESCRIPTION OF PLATE.

Drawn from a specimen grown in the Garden of the Royal Botanic Society, London.

1. Diagram of flower (the sepals should have been shown imbricate and the petals convolute in this figure).
2. Androecium and pistil.
3. Vertical, and—4. Transverse section of ovary.
5 and 6. Ripe fruit.
7. Section across the same.
8. Seed.
9, 10, and 11. Sections of the same.

(2—4 and 6—11 enlarged.)

D.Blair ad nat. del. et lith.

M&N Hanhart.

ERYTHROXYLON COCA, *Lam.*

N. Ord. Linaceæ.

Tribe *Erythroxyleæ*. Lindl., Veg. K., p. 391 (*N. Ord.*); Le Maout and Dec., p. 294.

Genus Erythroxylon,* *Linn.* B. & H., Gen., i, p. 244; Baill., Hist. Pl., v, p. 65. Species about 50, mostly natives of S. America, but some of Africa and India.

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40. Erythroxylon Coca,† *Lamarck, Dict.* ii, *p.* 393 (1786).

Coca. Cochuco. Hayo. Ipadu.

Figures.—Cavanilles, Diss., t. 229; Compend. Bot. Mag., ii, t. 21; Le Maout & Dec., p. 295; Baill., Hist., pl. v, figs. 80–87.

Description.—A small shrub of 2—4 feet or more high, bushy and much branched, with a purplish-brown wrinkled bark, the young twigs smooth. Leaves closely placed, alternate, shortly-stalked, 1—2 inches long, lanceolate or oval, rather attenuated into the petiole, usually blunt and emarginate with a small apiculus in the notch at the apex, perfectly entire, soon falling, rather thin, bright green above, paler and glaucous beneath, quite glabrous, midrib prominent, lateral veins numerous, faint, freely anastomosing; on either side of the midrib as far as a well-defined, curved, raised line less than midway between it and the margin of the leaf and extending from base to apex, the surface is somewhat concave, paler in colour and with the veins less prominent; stipules small, cauline, combined along their inner edge to form a single, triangular, acute, denticulate organ between the petiole and the stem (intrapetiolar), very persistent, at first thin, greenish and transparent, afterwards, when the leaves have fallen, brown, stiff, and almost spinous, and marked on the back at the base by the scar of the petiole. Flowers small, on slender, drooping, glabrous stalks about $\frac{1}{4}$ inch long, 3 or 4 together in the axils of the leaves or of the persistent stipules, with several small broad bracts at the base. Calyx very deeply cut into 5 triangular-ovate,

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* Name from ἐρυθρός, red, and ξύλον, wood; applicable to some species.

† *Coca*, the native name; meaning the "tree" or "plant" *par excellence.*

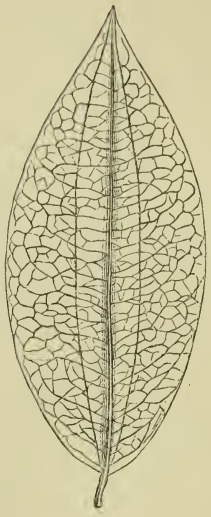
acute, glabrous segments. Petals 5, alternating with the calyx-lobes, imbricate, with a broad claw, and a broadly oval-oblong, spreading, concave, obtuse limb, pale yellow, provided at the point of junction of limb and claw with an erect scale (ligula), which is very deeply bifid with the two lobes crisped at the margins and a reflexed tongue between them. Stamens 10, hypogynous, equal, longer than the petals, erect, united at the base into a short, fleshy tube surrounding the ovary, filaments white, smooth, anthers oblong, yellow, basifixed. Ovary superior, ovoid, smooth, normally 3-celled, but usually 1-celled the others being abortive, ovule solitary, styles 3, erect, cylindrical, green, stigmas capitate. Fruit a small indehiscent drupe less than ½ inch long, oblong-ovoid, pointed, surrounded at the base by the persistent calyx and staminal tube, smooth (furrowed when dry), red, sarcocarp scanty, endocarp thin. Seed filling the endocarp, with a thin testa, embryo straight with a superior radicle and flat cotyledons, in the axis of cartilaginous endosperm.

Habitat.—The Coca is cultivated to a very large extent in the Andes of Peru and in Bolivia and Colombia, especially in the very moist mild climate met with at from 2000—5000 feet above sea-level or higher; it is also now grown in parts of Brazil, the Argentine States, and other countries of South America. Though without doubt a native of some of the same districts, it is scarcely known in a wild state; Poeppig considered it so at Cuchero and on the summit of the Cerro de San Cristobal in Peru, but Weddell in Bolivia only saw the cultivated plant.

The plantations (called "cocals") are always formed on the steep warm declivities of the mountains, the original forest growth being cleared for the purpose. The largest and most productive are in the province of La Paz in Bolivia. The Coca plants are said to resemble in habit small black-thorn bushes, and the nearly inodorous flowers are abundantly produced.

It is scarcely possible to mistake the leaves of Coca for those of any other plant, the two longitudinal arched lines on the under surface being characteristic. These, which are found in several other species of *Erythroxylon*, are not, as often described, veins or

nerves, but folds or creases produced by the mode in which the leaves are packed in the bud. A fully grown leaf is shown in the woodcut below, drawn from a specimen from Bolivia in the British Museum.



The precise date of the introduction of Coca into England we have not ascertained, but it was probably not many years previously to 1870; specimens are now to be seen in the houses of several of our botanic gardens.

Clusius, Exotic. (1605), p. 176; DC., Prod., i, p. 575; Poeppig, Reise in Chili, ii, p. 209, translated in Hook., Companion to Bot. Mag., i, p. 161; Lindl., Fl. Med., p. 199; Weddell, Voyage dans le Nord de la Bolivie, p. 514, translated in Pharm. Journ., 1855, pp. 162, 213; Dowdeswell, in Lancet, April 24th, 1876.

Part Used and Name.—Coca; the dried leaves. It is not official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United States. But Coca was in general use by the natives of Peru at the time of the conquest of that country, and has continued to be more or less extensively employed up to the present time.

Collection, Preparation, and Commerce.—Much care is taken in the gathering, drying, and preservation of coca, as its activity and value depend in a great measure on its mode of preparation. Some differences in detail occur in the collection and preparation of coca in different districts, but as a general rule the processes are as follows:—The leaves are gathered as soon as they have arrived at maturity, at which period they are bright green on their upper surface, and yellowish-green on their under surface; and have an agreeable and somewhat aromatic odour. The leaves are gathered separately and carefully by the hand, with the two-fold object of preventing them being crushed or bruised in the

process; and also so as not to injure the young leaf-buds which are left behind, for the purpose of obtaining a second crop of leaves. They are then carried away in baskets, and spread out on paved surfaces, or on the floors in the courts of the houses, or sometimes on woollen cloths; and dried slowly in the sun. This operation requires great care, for if the leaves be dried too rapidly, they lose their odour and green colour; and if stored away before they are thoroughly dried their colour is also changed, and they acquire a disagreeable odour and taste. In some districts the leaves are occasionally trampled over while they are damp, under the impression, it is said, that they thus acquire a delicate flavour and smell; but also, probably, to preserve their flatness in the drying process. After being dried, the leaves are either stored in barns or huts; or packed in bags or bales, in which they are pressed by treading, and are thus transported to a distance. These bags or bales (*cestos*) appear to differ very much in size, their weight being variously given by authors at from 24 to 150 lbs. As the properties of coca are injured by transportation, and often by keeping, it would probably be best preserved in cases or packages lined with tin, or at least in well-closed pots to protect it from air and moisture. The produce of coca per acre in a good harvest is estimated by Weddell at about 900 lbs.; and in some districts there are three or even four harvests in the year. The total produce of coca is probably not less than 40,000,000 lbs., which, estimating the value on an average at the low price of one shilling per pound (for the best qualities yield at least five shillings) in the countries in which it is produced, would represent a total value of £2,000,000; so that coca is by no means an unimportant article of commerce, and its production is moreover described as being very remunerative. It is chiefly exported from Lima.

General Characters and Composition.—Commercial specimens of coca either consist of the leaves more or less pressed together in compact masses, or of the leaves in a loose state or separate from one another. In either case the leaves are not curved or rolled in any degree, but perfectly flat. When carefully

prepared the leaves are unbroken, of a fine green colour, and a delicate agreeable somewhat aromatic odour, which is at once perceptible when they are bruised, and which has been compared to the combined odour of hay and chocolate; but specimens are often met with in which the green colour is replaced by brownish, yellowish- or reddish-brown tints, and the odour lost or of a more or less disagreeable character. Coca when fresh has a somewhat aromatic and slightly bitter taste; and when carefully dried it has a similar flavour; but in other cases its aroma is lost, and it is simply bitter and disagreeable. Coca of commerce varies very much indeed in quality.

Coca has been analysed by Niemann, Stanislas Martin, Maisch, Lossen, Woehler, and other chemists; and the results of their investigations show that its principal constituents are, a crystalline alkaloid called *cocaine*, a volatile odoriferous alkaloid named *hygrine*, *coca-tannic acid* and *coca-wax*. *Cocaine* is described as crystallizing in small colourless inodorous prisms, having a slightly bitter taste; sparingly soluble in water, more soluble in alcohol, and still more so in ether; it is strongly alkaline, and in most of its reactions is said to resemble atropia. When heated with strong hydrochloric acid it is resolved into a new alkaloid *ecgonine*, together with *methyl alcohol*, and *benzoic acid*. *Hygrine* at ordinary temperatures is a thick oily liquid of a yellowish colour, dissolving readily in alcohol and ether, but only partially soluble in water. "It possesses a strong alkaline reaction, a burning taste, and an odour of trimethylamin." The medicinal properties of coca would appear to depend essentially on cocaine and hygrine. Both these alkaloids seem to be in combination with one or more acids; probably the variety of tannic acid already mentioned, as the addition of lime or other alkali is said to increase to a great extent the flavour and activity of the drug. This latter fact has a very important bearing on the preparations of coca; as those obtained by the agency of milk of lime would thus appear to be more active than simple infusions or extracts of the drug; the latter are, however, frequently used.

Properties and Uses.—Coca has been used by the natives of Peru and some other parts of South America from the earliest periods. The Indians ascribe to it many and great virtues. Thus they believe that it possesses marvellous sustaining powers, and that its use enables them to undergo great fatigue and want of sleep for a long time in the absence of food. Commonly the Indians pass whole days in travelling or working without any food, but simply chew coca; but they eat freely in the evenings. It is also employed as a stimulant or narcotic in the same manner as tobacco, opium, and alcohol are thus used in other countries. The use of coca is also said to prevent the difficulty of respiration which is generally experienced in ascending high and steep mountains. The leaves are likewise regarded as a very valuable application to ulcers, boils, &c.; also to stop hæmorrhage; and for the relief of headache, neuralgia, &c. In the form of infusion coca is also employed in asthma, colic, jaundice, hypochondriasis, and many other affections. Indeed, coca is to the Indians almost a necessity, and to be deprived of it would be felt by them more than the loss of any other substance. Every Indian carries with him suspended from his belt a little bag or pouch called *huallqui* or the *chuspa*, which contains coca; and also a little bottle-gourd or calabash (*ishcupura*) containing some finely powdered lime, or wood ashes formed of the burnt stems of the *Chenopodium Quinoa*, *Cecropia peltata*, or other plants. This bottle-gourd has frequently a wooden or metal needle attached to its stopper; otherwise the Indian also takes with him a little stick or slip of wood for the purpose of helping himself to its contents as he desires. The native takes his coca three or four times a day; and in doing so he first removes the leaves separately from the pouch and places them in his mouth, and with his tongue forms them into a kind of ball; he then moistens the slip of wood or needle in the stopper of the calabash with saliva, and dips it into the lime or wood ashes which is locally termed the *Llipta*, and presses it on the ball of leaves in his mouth. The lime is added as already noticed under the belief that it develops the flavour of the coca, and also it is said to produce a flow of saliva, which is

either entirely swallowed or partially expectorated. This operation of chewing generally takes about a quarter of an hour, during which period the Indians remain perfectly at rest and are silent. In some cases, however, as with post-runners, drivers, and miners, the chewing is continuous.

The extraordinary virtues ascribed to coca by the Indians has naturally excited the attention of numerous travellers, physicians, and other persons, and their opinion of its merits will be best judged of by a few references to their published statements. Thus Poeppig states, that the miners chewing it every three hours with a handful of maize will do such severe work in the mine for twelve hours as no European could effect; and that an Indian runner will carry a load of a hundred weight for ten leagues over rough roads in eight hours by its aid alone. Von Tschudi and Dr. Scherzer have also given similar testimony to the effects of coca; and the former especially refers to the effect it had on himself in greatly assisting respiration, and thus enabling him to ascend the mountains with ease in hunting. Stevenson also, who for twenty years resided in Peru, and was Secretary to the Governor of Quito, states "that the natives in the mines and travelling derive such sustenance from chewing these leaves that they frequently take no food for four or five days, though constantly working; and that they had told him that with a good supply of coca, they felt neither hunger, thirst, nor fatigue, and that without inconvenience or injury they could remain eight or ten days without sleep." Dr. Weddell, Spruce, Markham, and numerous other travellers and scientific observers, also attribute the same effects to it. Markham says, "I chewed coca, not constantly, but very frequently, and besides the agreeable soothing feeling it produced, I found I could endure long abstinence from food with less inconvenience than I should otherwise have felt, and it enabled me to ascend precipitous mountain sides with a feeling of lightness and elasticity, and without losing breath." Most writers, however, agree, that when coca is taken in excess it produces highly injurious effects like the immoderate consumption of other stimulants or narcotics, such as fermented

liquors, tobacco, opium, and Indian hemp. An habitual chewer is termed a *coquero*, and is said to be at once known "by his haggard look, gloomy and solitary habit, listless inability, and disinclination for any active employment." Weddell says its habitual use acts on Europeans more prejudicially than on the Indians accustomed to it from their early years; and that in some cases it causes a peculiar aberration of intellect, characterised by hallucinations. Von Tschudi and Poeppig also state that the result of intemperance in its use is frequently confirmed idiocy. More recently Dr. Mantegazza, of Berlin, who formerly practised in South America, from numerous experiments drew the following conclusions:—The leaves chewed or taken in weak infusion have a stimulating effect on the nerves of the stomach, and thus greatly assist digestion. In a medium dose of three or four drachms, coca excites the nervous system in such a manner that muscular exertion is made with great ease; then it produces a calming effect. In a large dose it increases the animal heat and augments the frequency of the pulse, and consequently of respiration. Used in excessive doses it causes delirium, hallucinations, and, finally, congestion of the brain. He recommends its use as an antispasmodic; for colic, flatulence, diarrhœa, and impaired digestion; in dyspeptic and all spasmodic affections; as a tonic in debility and nervous prostration; in hysteria and melancholia; as a safe aphrodisiac in seminal debility; and in other affections. Many other practitioners have also spoken in eulogistic terms of its value as a remedial agent in a variety of diseases; and the sulphate of cocaine has even been recommended as a substitute for sulphate of quinia in intermittent fevers. Dr. Buzzard, however, who tried it extensively in epilepsy and other forms of nervous diseases some years ago, obtained no striking effects from its use.

More recently the address of Sir Robert Christison to the Royal Botanical Society of Edinburgh has been especially the means of drawing attention to the alleged properties of coca. From experiments made by Christison on himself, and also from those made by several students at his request by chewing coca

without the addition of the *Llipta* which he regards as useless, he drew the following conclusions :—"The chewing of coca removes extreme fatigue, and prevents it. Hunger and thirst are suspended; but eventually appetite and digestion are unaffected. No injury whatever is sustained at the time or subsequently in occasional trials; but I can say nothing of what may or may not happen if it be used habitually. From sixty to ninety grains are sufficient for one trial; but some persons either require more, or are constitutionally proof against its restorative action. It has no effect on the mental faculties, so far as my own observations go, except liberating them from the dulness and drowsiness which follow great bodily fatigue. I do not yet know its effect on mental fatigue purely. As to the several functions, it reduces the effect of severe protracted exercise in accelerating the pulse. It increases the saliva, which, however, may be no more than the effect of mastication. It does not diminish the perspiration so far as I can judge. It probably lessens the hourly secretion of urine solids." Christison made no trials of its influence on disease orthe consequences of disease. It has been stated that the success of Weston as a pedestrian was due to his chewing coca, but in a letter to the 'Lancet' he states that he found it rather lessened than increased his strength; in fact, it acted as an opiate and forced him to sleep. Since the publication of the above results by Christison a series of most carefully conducted experimental observations on the properties and action of coca has been made by Mr. Dowdeswell in the Physiological Laboratory of University College, London. The results of these various trials are published by the author in the 'Lancet' for May 6th, 1876, and are thus summarised by himself: "These results, as far as they go, are negative, as many most competent to judge concluded that they would be; but contrary to the expectations of the writer, formed from published statements. It has been taken in all forms, solid and liquid, hot and cold, at all hours from 7 o'clock in the morning till 1 or 2 o'clock at night, fasting and after eating. In the course of a month nearly one pound of the leaves altogether has been consumed, but without producing any decided effect; it has not affected the

pupil nor the state of the skin; it has caused neither drowsiness nor sleeplessness; assuredly it has occasioned none of those subjective effects so fervidly described and ascribed to it by others—not the slightest excitement, nor even the feeling of buoyancy and exhilaration which is experienced from mountain air, or a draught of spring water. This examination was commenced in the expectation that the drug would prove important and interesting physiologically, and perhaps valuable as a therapeutical agent. This expectation has been disappointed. Without asserting that it is positively inert, it is concluded from these experiments that its action is so slight as to preclude the idea of its having any value either therapeutically or popularly; and it is the belief of the writer, from observation upon the effect on the pulse, &c., of tea, milk-and-water, and even plain water, hot, tepid, and cold, that such things may, at slightly different temperatures, produce a more decided effect than even large doses of coca if taken at about the temperature of the body. What its physiological action may be, particularly on the lower animals, in highly concentrated doses, as of the alkaloid or the distillate, is another question, as it is whether the subjective effects which have been asserted may not offer a question of curious nervous idiosyncrasies."

These results of Mr. Dowdeswell's would appear to set at rest the claims of coca as a therapeutical agent. Very recently, however, a writer in the 'Lancet' has again described it as a powerful nervine tonic, and recommends its use to sportsmen whose nervous system is badly adapted for steady shooting.

Voyage dans le Nord de Bolivie, &c., par Docteur Weddell (Paris, 1853); Johnston's Chemistry of Common Life, vol. ii, p. 138; Watts, Dict. Chem., vol. i, p. 1059; U. S. Disp., by W. & B., p. 1591; Weddell, in Pharm. Journ., vol. xiv, 1 ser., pp. 163 and 213; Mantegazza, in Pharm. Journ., vol. i, 2 ser., p. 616; Pharm. Journ., vol. i, 3 ser., p. 43; Simmonds, in Chemist and Druggist for April and May, 1876, pp. 112 and 155; Shuttleworth, in Canadian Pharm. Journ., Nov., 1874, and English Pharm. Journ., vol. v, 3 ser., p. 483; Amer. Journ. Pharm., March, 1861, p. 122, and Nov., 1861, p. 500; Journ. de Pharm., Avril, 1859, p. 283, and Juin, 1862, p. 522; Fuentes, Journ. de Pharm., 4 ser., vol. iv, p. 268; Reis, Bullet.

Gen. de Therap., Feb. 28, 1866, and Pharm. Journ., vol. viii, 2 ser., p. 299; Christison, in British Medical Journal, April 29, 1876, and Pharm. Journ., vol. vi, 3 ser., p. 883; Dowdeswell, in Lancet for April 29, 1876, p. 631, and May 6, p. 664.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Royal Gardens, Kew, flowering in May; the fruit added from a specimen in the Kew herbarium collected in Bolivia.

1. A branch with young foliage and flowers.
2. A flower.
3. Petals.
4. Flower with petals removed.
5. Calyx and pistil.
6. Vertical, and—
7 and 8. Transverse section of ovary.
9, 10. Fruit.
11. Transverse section of the same.
12. Stipules.
13. Apex of leaf.

(2–8, 10–12 enlarged.)

T. Blair F.L.S. ad nat. del. et lith.

M & N Hanhart imp.

GUAIACUM OFFICINALE, *Linn.*

N. Ord. Zygophyllaceæ. Lindl., Veg. Kingd., p. 478; Le Maout & Dec., p. 303; Baillon, Hist. Pl., iv (under *Rutaceæ*).

Genus Guaiacum,* *Linn.* B. & H., Gen., i, p. 267; Baill., Hist. Pl., iv, p. 508. Species 8, natives of the hot parts of America and the West Indies.

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41. Guaiacum officinale, *Linn., Sp. Plant., ed.* 1, *p.* 381 (1753).

Jamaica Guaiacum. Lignum Vitæ.

Figures.—Woodville, t. 230; Nees, t. 380; Hayne, xii, t. 28; Berg & Sch., t. 146.

Description.—A small tree reaching 20 or 30 feet in height, with numerous crowded, flexuous, spreading, jointed, knotty, cylindrical branches; bark smooth, ash-grey; young shoots somewhat flattened, glabrous, often several from a node. Leaves numerous, evergreen, crowded, spreading, opposite, with very caducous stipules, about 3 inches long, abruptly pinnate; rachis deeply channeled above; leaflets opposite in 2 or 3 pairs, sessile, articulated with rachis, unequal, the terminal pair the largest and approximated, all broadly oval or obovate, very obtuse at apex, rounded at the base, often unequal-sided, entire, rather thick, quite glabrous, bright green, veins rather prominent above invisible beneath. Flowers rather large, on slender, straight, finely pubescent peduncles about an inch long, coming off in clusters of about 4—10 from two prominent bosses between the leaves, one on each side of the node. Sepals 5, very much imbricated, unequal, the outer shorter, broadly oblong-oval, very obtuse, pubescent, thick, thinning at the margins. Petals 5, equal, imbricate, spreading, more than twice as long as the sepals, oblong-oval, bluntish, with a short claw, pubescent outside when young, bright pale blue. Stamens 10, in one row, rather shorter than the petals, filaments dilated and often slightly coherent below, tapering, anthers small, sagittate, introrse, orange. Ovary raised on broad compressed gynophore, flattened, smooth,

* *Guaiacum*, from *Guayacan* or *Gayco*, the native name.

obovate-oblong, 2-celled, with several pendulous ovules in each cell with delicate funicles and with the coats prolonged into long tubes; style tapering, subulate, stigma simple. Fruit shortly stipitate, about ¾ inch long, compressed, obcordate, smooth, brownish-yellow, 2-celled, pericarp leathery. Seed solitary in each cell, ovoid, slightly compressed, testa rather thick, embryo straight, green, with leafy cotyledons, in the axis of the horny endosperm.

Habitat.—This evergreen tree, of somewhat peculiar appearance, grows in most of the West Indian islands, especially in Jamaica, Hayti, and Cuba. It is also found in Columbia and Venezuela on the S. American continent. It was cultivated here at the end of the 17th century, and is to be found in several botanic gardens, where it occasionally flowers. In Jamaica it flowers in February.

G. sanctum, Linn., which grows in Cuba and the Bahamas, does not occur in South America, but is found at Key West in Florida. It is figured in A. Gray's 'Illust. Gen. N. America,' ii, t. 148, and is distinguished from *G. officinale* by its smaller and narrower leaflets in 3 or more pairs and with a muconate apex, and by the (usually) 5-celled ovary and fruit of 5-winged compressed carpels. The figure in Steph. and Ch., t. 90, appears to represent this species.

Grisebach, Fl. Brit. W. Indies, p. 134; Macfadyen, Fl. Jamaica, i, p. 187; Lindl., Fl. Medica, p. 214.

Official Parts and Names.—1. Guaiaci Lignum; the wood, reduced by the turning lathe to the form of a coarse powder or small chips: 2. Guaiaci Resina; the resin, obtained from the stem by natural exudation, by incisions, or by heat (B. P.). 1. The Wood: 2. The Resin (I. P.). 1. Guaiaci Lignum; the heartwood: 2. Guaiaci Resina; a peculiar resin obtained from Guaiacum officinale, by spontaneous exudation, by incision, by dry heat, or by decoction of the comminuted wood (U. S. P.). Although the wood and resin are officially said to be derived from *Guaiacum officinale* alone, some of the wood and resin are also obtained from *Guaiacum sanctum*.

1. Guaiaci Lignum. — *General Characters and Composition.*

Guaiacum Wood, which is known in commerce as *Lignum vitæ*, is imported in large logs or billets, which sometimes weigh as much as a hundredweight, and from which the bark has commonly been removed. A transverse section shows no evident pith, and but very indistinct, usually excentrically arranged rings. The distinction between the sapwood and heartwood is, however, very marked; the sapwood or alburnum being pale yellow, while the heartwood or duramen, which is sharply defined externally, is of a dark greenish-brown colour, in consequence of the deposition in it of guaiacum resin. The duramen forms the principal part of the wood; indeed, in the thickest pieces the alburnum is entirely wanting. The sapwood is tasteless and inodorous, and contains no resin; but the heartwood when chewed for a short time has an acrid, somewhat aromatic taste, and emits when rubbed, or more especially if heated, a weak, agreeable, somewhat aromatic odour.

As seen in the pharmacies guaiacum wood is in chips, shavings, or coarse powder, and may be usually distinguished from the similar parts of other woods (1) by consisting of a mixture of dark greenish-brown and yellowish portions; and (2) by nitric acid, which communicates to the dark-coloured pieces a temporary blueish-green colour. Another test is by adding a solution of corrosive sublimate to the portions of wood, and applying a moderate heat, when a blueish-green colour is also produced. Some specimens of guaiacum wood consist entirely of portions of the heartwood, indeed, the latter is alone recognised in the Pharmacopœia of the United States; but the wood generally is ordered in the British Pharmacopœia and the Pharmacopœia of India. The heartwood alone, however, possesses any medicinal properties, and should therefore be alone made official in future pharmacopœias.

The *bark* was formerly recognised, but at present, it is very rarely used. It contains a large amount of *oxalate of calcium*, a *resin* analogous to, but distinct from, that of the wood; and a *bitter acrid principle*.

The most important constituent of the wood, and the one to

which it owes its medicinal properties, is a *resin*, which is official, and will therefore be presently fully described.

Commerce.—The best kind of *Lignum vitæ* is imported from the city of St. Domingo. Some is also forwarded from other ports of Hayti Island; but it is less valued. Some wood of good quality, although small, is also obtained from the Bahamas and Jamaica; and a small quantity is likewise shipped from Santa Marta.

Adulterations.—No particular adulteration of guaiacum wood has been noticed in this country; but it would appear from recent investigations, that a spurious drug is by no means uncommon in the United States. Thus, Schultz examined eleven specimens of the rasped wood which he obtained from different cities in the United States, and found that, with one exception, they contained no resin. Now, as guaiacum wood "should contain," says Schultz, "26 per cent. of resin, and its activity is due to the resin, it is evident that the present commercial article is worthless, and it is either not guaiacum wood at all or such from which the resin has been extracted."

Medical Properties and Uses.—Guaiacum wood possesses stimulant, diaphoretic, and alterative properties like the resin; but its action is much milder than it. It was formerly largely used in syphilitic and cutaneous affections, as also in chronic rheumatism and gout, scrofula, and other diseases; but it is now scarcely ever employed except as an ingredient of the official compound decoction of Sarsaparilla of the British, Indian, and United States Pharmacopœias.

The wood is chiefly used on account of its hardness, toughness, density, and durability, which qualities render it of value for making pestles, blocks, pulleys, rulers, skittle balls, the large balls used in American bowling alleys, and for other purposes where such properties are required.

2. Guaiaci Resina.—*Extraction.* Guaiacum resin, or *guaiac* as it is termed in the United States Pharmacopœia, is principally derived from St. Domingo, although to some extent also, from Jamaica and other ports. Its botanical source is essentially

Guaiacum officinale. It is either a natural exudation; or is obtained after incisions made into the bark; or logs of the wood are suspended horizontally in the air by two upright stakes after having been much incised in their middle, and then set on fire at their two ends, the melted resin which then runs out from the centre in large quantity is received in a calabash or some other suitable receptacle.

General Characters and Composition.—Guaiacum resin either occurs in tears, or more commonly in large compact masses. The *tears of guaiacum* are rounded or somewhat oval in shape, and vary from about half an inch to one inch in diameter. They are usually covered by a greyish-green dust. Sometimes these tears are more or less agglutinated into small irregular shaped masses. *Lump guaiacum* is the ordinary kind met with in commerce. The masses are generally of large size, and contain pieces of bark, wood, and other impurities. Externally they have a brownish or greenish-brown colour, or when the surface has been rubbed and exposed to the air, it is covered with a greenish powder.

Guaiacum resin is brittle, breaking with a clean glassy fracture; thin laminæ are transparent, and have a greenish-brown colour. It is readily powdered, and when fresh the powder has a greyish colour; but by exposure to air and light it becomes green. Guaiacum has little odour except when powdered, in which case it is somewhat balsamic, and when exposed to a temperature of 185° it melts and emits an odour somewhat resembling benzoin; its taste is but slight at first, though when chewed, it leaves a burning sensation in the throat. Its specific gravity is about 1·2. It is readily soluble in alcohol, ether, chloroform, and solutions of the caustic alkalies. An alcoholic solution produces a clear blue colour when applied to the inner surface of a paring of raw potato. Another excellent test of guaiacum is nitric acid; thus, if paper which has been wetted with tincture of guaiacum be exposed to the fumes of nitric acid, it speedily becomes blue.

The principal constituents of guaiacum, as ascertained by

Hadelich, are two resinous acids, *guaiaconic* and *guaiaretic*, in the proportion of about 70 per cent. of the former, and 10 of the latter. The same chemist also found about 10 per cent. of a neutral resin, which he termed *guaiac beta-resin*, 3·5 of *gum*, small proportions of two crystalline substances called *guaiacic acid* and *guaiac-yellow*, mineral constituents, and impurities.

It is essentially to the presence of guaiaconic acid that guaiacum resin assumes a blue colour in the presence of oxidising agents, such as peroxide of hydrogen, ferric chloride, &c. Reducing agents and heat produce decoloration. The property thus possessed by guaiacum of assuming a blue colour, and then being decolorised, was taken advantage of by Schönbein in his researches on ozone. Schmidt also found, that a solution of hypochlorite of soda produced a green colour in a solution containing not more than $\frac{1}{320}$ part of guaiacum; hence advantage may be taken of this reaction to detect guaiacum resin, when used for adulterating scammony, and jalap and scammony resins.

Adulterations and Impurities.—Guaiacum resin is rarely or ever adulterated in this country. Turpentine resin has, however, been stated to be used for this purpose; and if so, this may be easily detected by the terebinthinate odour evolved when the resin thus adulterated is heated. Another ready way of detecting this adulteration is by hot oil of turpentine, for this liquid entirely dissolves the turpentine resin, but leaves the pure guaiac undissolved. Guaiacum resin is, however, commonly very impure, owing to the careless manner in which it is collected. Thus, in one sample examined by J. B. Barnes, he found 14·4 per cent. of impurities, and in another 11·7 per cent.

Medical Properties and Uses.—Guaiacum resin possesses stimulant, diaphoretic, and alterative properties like the wood; but its action is much stronger. By some practitioners it is also regarded as an emmenagogue. It is a useful remedy in chronic forms of rheumatism, more especially in that variety which is relieved by warmth; also in syphilitic and gouty affections,

scrofula, skin diseases; and in dysmenorrhœa, and other uterine affections, &c.

Per. Mat. Med., vol. ii, pt. 2, p. 406; Per. Mat. Med., by B. & R., p. 893; Pharmacographia, pp. 93 & 95; U. S. Disp., by W. & B., pp. 440 & 441; Watts, Dict. Chem., vol. ii, p. 947; Huraut, in Pharm. Journ., vol. xii, ser. 1, p. 450; Schultz, in the Chicago Pharmacist, Sept., 1873, p. 282, and in Proc. Amer. Pharm. Assoc., vol. xxii (1874), p. 132; Barnes, in Pharm. Journ., vol. iv, ser. 3, p. 361.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum, collected by R. Shakespeare in Jamaica.

1. A small branch with leaves and flowers.
2. A sepal.
3. A petal.
4. Transverse, and—5. Vertical section of ovary.
6. A stamen.
7. Pistil.
8. Fruit.
9. Vertical section of the same.
10. A seed.
11. Transverse section of the same.

(2–7 enlarged.)

D.Blair ad nat. del. et lith

M & N. Hanhart imp.

GERANIUM MACULATUM, *Linn.*

N. Ord. GERANIACEÆ. Lindl., Veg. K., p. 493; Le Maout & Dec., p. 306; Baill., Hist. Pl., v.

Tribe *Geranieæ*.

Genus Geranium,* *Linn.* B. & H., Gen. i, p. 272; Baill., v, p. 35. Species over 100, distributed through all the temperate parts of the world.

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42. Geranium maculatum, *Linn., Sp. Plant.*, 1, *p.* 681 (1753).

Alum-root. Wild Cranesbill. (United States.)

Figures.—Barton, i, t. 13; Bigelow, i, t. 8; A. Gray, Ill. Genera, t. 150.

Description.—A perennial herb, with a rather thick, cylindrical, branched, pale brown rhizome, giving off filiform rootlets. Stem erect, about 1—1½ feet high, cylindrical, green, covered with spreading or deflexed hairs, once or twice branched dichotomously. Root-leaves large, on very long hairy petioles, palmately veined, 5 or 6 inches wide, deeply cut into 5 (or 7) digitate, spreading, narrowly obovate lobes, irregularly and bluntly cut at the end; stem-leaves opposite, shortly stalked, with narrowly lanceolate, acuminate stipules at the base; all bright green, slightly hairy or smooth above, paler and covered with erect hairs below. Flowers in small terminal umbellate cymes, slightly nodding when in flower, an inch or more across, regular, peduncles usually 2-flowered. Sepals 5, lanceolate, with a long filiform point, green, hairy, persistent, 3-veined, imbricate. Petals 5, convolute in the bud, broadly obovate or rounded, entire, delicately veined, clear light purple, fugacious, claw very short, bearded; 5 small "glands" alternate with the petals on the receptacle. Stamens 10, hypogynous, free; filaments dilated at the base, those opposite to the petals rather shorter; anthers oblong, versatile, 2-celled, purple. Pistil of 5 carpels, placed round and united to a long, beak-like prolongation of the receptacle; ovary deeply 5-lobed, 5-celled, with two ovules in each cell; styles long, thickened and hairy in their lower part,

* *Geranium*, in Greek γεράνιον, the classical name; from γέρανος, a crane.

united to the central beak, but separate at the end to form 5 recurved branches, with the stigmatic surface internal. Fruit dry, the 5 small, hairy, 1-seeded carpels (cocci) separating septicidally and being carried away from the axis by the styles, which become detached from below and curve upwards elastically, so as to turn the cocci outwards and allow the seed to fall out. Seeds oblong, faintly reticulate under a lens; embryo with an incumbent radicle and large plicate cotyledons, no endosperm.

Habitat.—Very common in fields and bushy places in North America, extending from Canada throughout the United States, but only in the hilly districts in the south; a beautiful plant, flowering in the early summer. The name *maculatum* refers to the blotched appearance which the leaves assume as they become old. Frequently cultivated in this country. It is closely allied to the British Cranesbills *G. pratense*, L., and *G. sylvaticum*, L.

DC. Prod. i, p. 642; Hook, Fl. Bor.-Am., i, p. 115; A. Gray, Man. Bot. U. States, p. 107; Chapman, Fl. South. States, p. 65; Lindl., Fl. Med., p. 221.

Official Part and Name.—GERANIUM; the rhizome (U. S. P.). Not official in the British Pharmacopœia, or the Pharmacopœia of India.

Collection.—The rhizome is collected in the autumn months, or early in the spring before active vegetation has commenced; and then dried for use.

General Characters and Composition.—Geranium, as seen in commerce, either consists of the rhizomes alone, as is more generally the case, or of the rhizomes with small rootlets attached below; or rarely, the rootlets are seen in a loose state mixed with the rhizomes. It is commonly termed *alum-root*. The rhizome is usually simple, or rarely branched; it varies in length from one to about three inches, and in thickness from a quarter to half an inch or more. It is commonly much twisted, somewhat flattened, and marked externally with numerous wrinkles and thick hard projections of varying lengths, so that it presents an irregular, somewhat coralline appearance. It has a dark reddish or umber-brown colour externally; and a reddish-grey or pale flesh colour internally. It

has a compact texture, and a short close fracture. A transverse section shows a large central mass of a reddish-flesh colour, surrounded by a thin dark brown cortical portion. It has no odour, but a very astringent taste without any bitterness.

Geranium or alum-root appears to owe its activity solely to the presence of *tannic* and *gallic acids*, which according to the analysis of the Messrs. Tilden, of New York, are contained to the amount of about 4 per cent. The so-called active principle termed *Geranin* by the Eclectic practitioners in the United States, is a kind of *resinoid extract*.

Medical Properties and Uses.—Geranium is rarely used beyond the United States, but in that country it is extensively employed, and is regarded as applicable in all cases where astringent medicines are required. The absence of any disagreeable taste or other quality is also considered to render it peculiarly serviceable for infants, and persons of very delicate stomach. It has been employed internally in diarrhœa, chronic dysentery, cholera infantum in the latter stages, and in various hæmorrhages, with the greatest advantage. As a local application in chronic inflammation, ulceration, &c., benefit may be equally expected from it, as, for instance, in the form of a gargle where the throat is involved, and in that of injection in gonorrhœa and leucorrhœa.

U. S. Disp., by W. and B., p. 426; Per. Mat. Med., vol. ii, pt. 2, p. 705; Staples, in Journ. Phil. Coll. Pharm., Oct., 1829, p. 171; Amer. Journ. Pharm., vol. i, p. 171; Lee, in American Journ. Mat. Med., July, 1859, p. 199; Bentley, in Pharm. Journ., vol. v, 2nd ser., p. 21.

DESCRIPTION OF PLATE.

Drawn from a specimen in the garden of the Apothecaries' Company, Chelsea. 1. Upper part of flowering stem. 2. Root-stock and root-leaf. 3. Section of flower. 4. Ripe fruit after dehiscence. 5. Seed. 6. Transverse section of the same. (3, 5, 6 enlarged.)

T.Blair F.L.S. ad vivo del et lith

GALIPEA CUSPARIA. *St. Hil*

M & N.Hanhart imp.

N. Ord. Rutaceæ. Lindl., Veg. Kingd., p. 469; Le Maout & Dec., p. 315; Baill., Hist. Pl., iv.

Tribe *Cusparieæ*.

Genus Galipea,* *Aublet.* B. & H., Gen., i, p. 285. Species about 30, natives of tropical America.

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43. Galipea Cusparia,† *St. Hilaire in DC. Prod.*, i, *p.* 731 (1824).

Orayuri (Guiana). *Carony Bark.*

Syn.—G. officinalis, *Hancock.* G. febrifuga, *Baill.* Cusparia febrifuga, *Humb.* C. trifoliata, *Engler.* Angostura Cuspare, *Roem. & Sch.* Bonplandia trifoliata, *Willd.* B. Angostura, *Rich.*

Figures.—Hayne, i, t. 18; Humb., Bonpl. & K., Pl. Æquinoct., ii, t. 97, cop. in Steph. & Ch., t. 149; Trans. Med.-Bot. Soc. Lond., i, t. 2 (*G. officinalis*); Nees, t. 384; Woodville, vol. v.

Description.—A small tree scarcely exceeding 15 feet in height, with a slender trunk, considerably branched, bark smooth, grey. Leaves alternate, on long smooth stalks, without stipules, trifoliolate, leaflets sessile or nearly so, the terminal one rather the longer, 6—12 inches long, oval, acuminate at the apex, tapering at the base, entire, smooth, shining, bright green, paler and with the veins prominent beneath. Flowers rather large, on short, thick, densely pubescent stalks, arranged in small clusters in elongated long-stalked panicles from the leaf-axils and terminal, peduncle and branches densely but finely tomentose and dotted with white, bracts lanceolate, acute, short. Calyx densely pubescent, cut nearly to the base into 5 equal, erect, narrowly triangular, acute segments. Corolla gamopetalous, tubular below, divided half way down into 5 oblong, very obtuse or spathulate, concave, imbricate segments, finely tomentose within

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* *Galipea*; probably from the name of the country where the original species (*G. trifoliata*, Aubl.) was found.

† *Cuspare* is stated by Humboldt to be the vernacular name, but Hancock considers this an error; Engler, however, gives it as the name in New Granada.

and without, and also with tufts of hairs on the outside, thick, with glands in its substance, white. Stamens 5, inserted at the top of the corolla-tube, and shorter than its segments, only two usually bearing anthers, filaments flattened, glabrous, of the fertile stamens short, of the barren ones strap-shaped and terminated by a round knob, anthers linear, introrse, basifixed, sagittate at the base. Pistil of 5 carpels, the ovaries free, surrounded by a thick, fleshy, slightly 10-lobed disk, which almost completely encloses them; styles combined, slender, about the length of the stamens; stigmas separate, short, blunt. Fruit of 5 dry, leathery cocci, $\frac{5}{8}$ inch long, somewhat curved outwards, with raised, transverse ribs, scabrous-pubescent, dehiscing along ventral suture, the endocarp also separating and coming away with the seed. Seed (not seen) solitary, kidney-shaped, black and shining, embryo with large conduplicate cotyledons wrapped round the inflexed radicle; no endosperm.

Habitat.—Found in the eastern parts of Venezuela, especially in the hills near San Joaquin de Caroni, near the river of that name, which is a tributary of the Orinoko, between 7° and 8° N. lat. It here grows in rich soil at an elevation of 600 to 1000 feet above sea-level. It appears to extend into New Granada, but has not yet been observed in Brazil. The showy white flowers appear in August and September or earlier, and the fruit is ripe in October and November. The flowers and bruised foliage are said to have a peculiar and rather unpleasant odour.

The petals in this species are completely fused in their lower part, and form thus a thoroughly gamopetalous corolla.

Dr. Hancock was of opinion that his *G. officinalis* was a different species to the plant of Humboldt, and has given the characters which he believed distinguished it. These are, however, of but trifling importance, and quite insufficient for the purpose.

Engler considers the genus *Cusparia*, Humb. (*Bonplandia*, Willd.), to be distinct from *Galipea*, and he describes twenty-one species in his recent monograph in the 'Flora Brasiliensis.'

DC. Prod. i, p. 731; Hancock, in Trans. Med.-Bot. Soc. Lond., i, p. 16; Engler, in Flor. Brasil. Rutaceæ, p. 113; Lindl., Fl. Med., p. 210; Flück. & Hanb., Pharmacogr., p. 97.

Official Part and Names.—Cusparıæ Cortex; the bark (B. P.). The bark (I. P.). Angustura; the bark of Galipea officinalis, *Hancock* (U. S. P.). Although the botanical source of this bark is given in the Pharmacopœia of the United States as *Galipea officinalis,* there is, as noticed in our description of the plant, no important difference between *Galipea officinalis,* Hancock, and *G. Cusparia,* St. Hil.; hence the source is correctly given in the British Pharmacopœia and in the Pharmacopœia of India.

Commerce.—Cusparia bark is imported indirectly from the West Indies packed in casks, or directly from South America.

General Characters and Composition.—This bark, which is known in commerce as *Cusparia* or *Angustura bark,* occurs in straight, flattish or more or less curved pieces, or in quills; it varies much in length, although rarely more than six inches; and the flattish pieces are an inch or more in width. The pieces of bark seldom exceed one eighth of an inch in thickness, and are commonly less than this. They are usually cut obliquely at their edges, and are covered by a yellowish-grey or brownish, mottled, somewhat corky layer, which may be generally scraped off by the nail; and the exposed surface then presents a dark-brown resinous appearance. The inner surface is light-brown or yellowish-brown; it is readily separable into layers, and sometimes it has attached to it strips of the wood. The bark has a short, resinous fracture, and the exposed surfaces exhibit, especially when viewed with a magnifying lens, minute points or lines, which are due to deposits of oxalate of lime. It has a bitter, very feebly pungent or somewhat aromatic taste; and a peculiar, disagreeable, musty odour.

The principal constituents of cusparia bark are a *volatile oil* and a *bitter principle.* The *volatile oil* which may be obtained by distillation of the bark with water, exists according to Herzog, in the proportion of about $\frac{3}{4}$ per cent. It has a yellowish-white colour, the odour of the bark, and an acrid taste. Its boiling

point is 511°, which is one of the highest known of the volatile oils. The bitter principle, called *angusturin* or *cusparin*, was first noticed by Saladin. It is described as neutral, crystallising in tetrahedra, soluble in alcohol, sparingly so in water, and precipitated from its solutions by tannic acid. It is said to exist in the bark in the proportion of about 1·3 per cent. It requires further investigation. The medicinal properties of angustura bark are essentially due to the conjoint action of the volatile oil and bitter principle.

Substitutions.—At the commencement of the present century a bark was imported from India, which was mistaken for Angustura bark, and therefore sold for, or mixed with it. Some serious accidents having occurred from its use, it was carefully examined, and ultimately found to be the poisonous bark of *Strychnos Nux-vomica*, as mentioned by us when describing that plant. Hence arose the distinction into *true* or *West India angustura*, and *false, spurious*, or *East India angustura bark*. No such substitution has, however, occurred recently, although it was detected about thirty years ago in Dublin; but as it is of such a serious nature it will be advisable to state that the two barks may be readily distinguished by the following characters :—1. Nux-vomica bark has no odour, but a pure and intensely bitter taste; 2, the fractured surfaces of the false bark present no white spots of oxalate of lime; 3, when touched by nitric acid the inner freshly cut, or the fractured surface of nux-vomica bark assumes an arterial blood-red colour, while true cusparia bark, under the same circumstances, is rendered of a dull purplish-red colour, like that of venous blood; and 4, the suberous layer of the false bark is coloured emerald green by nitric acid, whilst that of the true bark is not altered by its action. The red coloration caused by nitric acid in the true bark is most marked immediately after it is touched with nitric acid, and is also most evident in the inner liber-cells.

In 1874, Professor Maisch described a new "false Angustura bark," which, he states, probably reached Philadelphia from New York. This false angustura bark was found in flattish pieces and

quills, which were either covered with a greyish corky layer with patches of an orange shade, or composed entirely of liber. The inner surface was dark brown; and the fracture, although short, was distinctly fibrous. It is readily distinguishable from true angustura bark by the characters already given of that bark. Since the notice of this false angustura bark by Maisch, Oberlin and Schlagdenhauffen have stated that in French drug stores generally, a bark is met with the characters of which correspond completely with those of the false angustura bark described by him. According to them this spurious bark is derived from *Esenbeckia febrifuga*, Martius, a tree which is very abundant in the province of Minas Geraes, Brazil; and the bark of which is there highly esteemed as a tonic, febrifuge, and antidysenteric. It is known to the natives as *China Piavi*, *China du Brésil* (Brazil bark). It is said to contain an alkaloid.

Medical Properties and Uses.—Cusparia bark is a stimulant aromatic tonic, and febrifuge; and in large doses it produces nausea and purging. It has long been regarded as a valuable remedy by the natives of those parts of tropical South America, where it grows, and also in the West Indies; and although it has been employed with success in this country and the United States in atonic dyspepsia, chronic diarrhœa, and dysentery, and in the treatment of debility arising from acute and exhausting diseases, it is now but rarely prescribed. In tropical South America it has been used with great success in the treatment of the low malignant fevers which there occur in marshy districts.

Per. Mat. Med., vol. ii, pt. 2, p. 402; Per. Mat. Med., by B. & R., p. 890; Pharmacographia, p. 97; U. S. Disp., by W. & B., p. 124; Herzog, Archiv d. Pharm. (1858), p. 146, and Chem. Gaz., May 15, 1858; Cazeneuve, Repertoire de Pharmacie, May 10, 1874, p. 261, and Pharm. Journ., ser. 3, vol. v, p. 7; Pharm. Journ., ser. 3, vol. iv, p. 681, from Amer. Journ. Pharm., Feb., 1874, p. 50; Oberlin & Schlagdenhauffen, Journ. de Ph. et de Chim., August, 1874, and Amer. Jl. Pharm., Sept., 1874, p. 414.

DESCRIPTION OF PLATE.

Drawn from specimens in the Kew Herbarium, collected near the Orinoko by Hancock, and near Cumana by Funcke (no. 300), both in Venezuela.

1. A leaf and flower-panicle.
2. Corolla laid open.
3. Calyx, cut away to show pistil and disk.
4. Disk and ovaries.
5. The same in section, and the stigmas.
6. Barren stamen.
7. Fertile stamen.
8. A coccus.

(3–7 enlarged.)

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N. Ord. RUTACEÆ.

Tribe *Ruteæ*.

Genus Ruta, *Linn.** B. & H. Gen., i, p. 286; Baill., Hist., pl. iv, p. 373. Species 40 or more, natives of Western Asia and the Mediterranean region.

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44. Ruta graveolens,† *Linn., Sp. Pl., ed.* 2, *p.* 383 (in part) (1753).

Rue.

Figures.—Woodville, t. 174; Steph. & Ch., t. 71; Hayne, vi, t. 8; Nees, t. 376; Berg & Sch., t. 24 f.; Baill., l. c., figs. 391—397.

Description.—A perennial herbaceous or half-shrubby plant, reaching 2 or $2\frac{1}{2}$ feet in height. Stems cylindrical, slender, branched in the upper part, quite smooth, pale glaucous green, somewhat shrubby at the base, and there covered with a grey bark. Leaves alternate, without stipules, compound, the lower ones tripinnate, the upper ones sub-bipinnate or pinnate, the highest simple, leaflets linear-oval or oblong, the terminal ones obovate, all dotted with small pellucid glands, rather thick, bluish-green. Inflorescence a terminal corymbose irregularly trichotomous cyme. Flowers on long stalks, erect, nearly an inch across. Calyx of 4 (or 5) sepals, slightly connected, narrow, acute, semi-persistent. Petals alternating with the sepals which they greatly exceed, distant, widely spreading, greenish-yellow, wide and hooded at the top, suddenly contracted into a narrow claw below, the margin more or less wavy and sometimes toothed. Stamens twice as many as the petals, 8 (or 10), inserted below the hypogynous disk, half opposite the sepals, half opposite the petals, in the concave limbs of which they are at first contained; filaments slender, glabrous, at length straight and exceeding the petals. Pistil surrounded at the base and supported by a thick fleshy green sticky disk, marked opposite each stamen with a deep

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* *Ruta*, the classical name.

† *graveolens*, strong-smelling.

nectariferous pore ; ovary large, 4- (or 5-) lobed, the lobes (carpels) separate above, strongly dotted with sunk glands, 4-celled, ovules numerous on axile placentas ; styles coming off from the inner side of the carpels, combined into a single body tapering to the apical stigma. Fruit dry, hard, roundish, 4- or 5-lobed at top, greyish-brown, rough, each carpel dehiscing from above ventrally and also for some way down the dorsal suture. Seeds ovoid, rounded on the back, flattish in front, angular, testa blackish, rough ; embryo slightly curved from base to apex, surrounded by scanty fleshy endosperm.

The central terminal flowers of the corymbs are usually 5-merous, the others generally 4-merous.

Habitat.—The common Rue grows in waste stony ground throughout the south of Europe, extending from Spain and Portugal to Greece and the Crimea. It also occurs in the Canaries, and is cultivated in gardens in India and other countries. In this country it is very hardy and one of our oldest garden plants, usually continuing green through the winter, and the empty dry capsules remaining on the withered flower-stalks through the next flowering season.

Boiss., Fl. Orient., i, p. 921 ; Hook. f., Fl. India, i, p. 485 ; Lindl., Fl. Med., p. 210.

Official Parts and Names.—Oleum Rutæ ; the oil distilled from the fresh herb (B. P.). The herb (*Ruta*) (I. P.). Ruta ; the leaves (U. S. P.).

1. Ruta.—The fresh herb has a very strong disagreeable odour, especially when rubbed ; and a bitter, acrid, nauseous taste. When dried its odour is similar, but less powerful, and it has a greyish-green colour.

The principal constituents of Rue are the *volatile oil* (see *Oleum Rutæ*), on which its properties essentially depend, and a *bitter extractive matter* which is soluble in water, but insoluble in alcohol and ether.

2. Oleum Rutæ.—By distillation with water the fresh herb yields a small quantity of volatile oil, the produce being largest

when the fruits are fully formed, but only about 0·50 per cent. can even then be obtained. Oil of Rue has a pale yellow colour when fresh, but it becomes brown by keeping. Its odour is strong and disagreeable, like that of the herb; and it has an acrid and nauseous taste. Its specific gravity is stated by Kane to be 0·837 at 18°, but Pereira gives it as 0·911.

Medical Properties and Uses.—The herb and the oil act as stimulants, their influence being chiefly directed to the uterine and nervous systems. Rue has also been regarded as anthelmintic; and in excessive doses it is an acro-narcotic poison. When fresh its topical action is that of an acrid; so greatly so, indeed, that if much handled it causes redness, swelling, and even vesication. Rue was formerly much employed, but it is rarely prescribed at the present day, although *rue tea* is still a popular remedy. It may be given in hysteria, amenorrhœa, epilepsy, flatulent colic, infantile convulsions, &c., and appears to have fallen too much into disuse. The oil is the best form of administration; it may also be used externally as a rubefacient.

The ancients employed rue as a condiment, and for ages it was regarded as most beneficial in warding off contagion, and even now is sometimes used to keep off noxious insects.

Per. Mat. Med., vol. ii, part ii, p. 396; U. S. Disp., by W. & B., pp. 748 and 1312; Garr. Mat. Med., p. 225.

DESCRIPTION OF PLATE.

Drawn from a specimen grown in the Royal Botanic Society's Garden.

1. A flowering stem.
2. A flower.
3. Vertical section of the pistil.
4. Transverse section of the ovary.

5 and 6. Ripe capsule.

7 and 8. A seed.

9. Vertical section of the same.

(2—4, and 6—9 enlarged.)

BAROSMA BETULINA, *Bartl. & Wendl.*

N. Ord. RUTACEÆ. Lindl., Veg. K., p. 469; Baill., Hist. Pl., vol. iv.

Tribe *Diosmeæ*. Le Maout & Dec., Syst., p. 321.

Genus **Barosma**,* *Willd.* B. & H. Gen., i, p. 290; Baill., Hist., iv, p. 458; Berg, in Bot. Zeitung, 1853, 905–913; Harvey, Fl. Cap., i, pp. 392–4. Species about 12, natives of the Cape of Good Hope.

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45. **Barosma betulina**,† *Bartl. & Wendl. Beitr. z. Bot., Diosm., p.* 102 (1824).

Bucchu. Buchu. Bucco. Buku.

Syn.—Diosma betulina, *Thunb.*‡ Bucco betulina, *Roem. & Schultes.*‡ Hartogia capensis, *Bergius.* Diosma crenata, *DC., Lindl., Loddiges, Woodville,* &c. (non *Linn.*).

Figures.—Lodd., Bot. Cab., t. 404, cop. in Steph. & Ch., t. 121 and Woodville, vol. v; Berg & Sch., t. 1 f.

Description.—A small much-branched shrub; branches slender, somewhat twisted, slightly angular, with greyish-orange bark, young twigs set with oil glands. Leaves nearly sessile, opposite, or scattered, small, ½—¾ of an inch long, variable in form, usually cuneate- or rhomboid-obovate, texture cartilaginous, midrib prominent, lateral veins scarcely visible, apex very blunt, usually recurved, under surface slightly paler, with scattered glands, margin serrate-dentate with few close large cartilaginous teeth with glands in the serratures, nearly entire below. Flowers as in *B. crenulata*, Hook., but the petals somewhat narrower and more pink in colour; the fruit and seed appear also to be quite the same as in that species.

Habitat.—This species of *Barosma* grows in mountainous places in the district of Clanwilliam, north of Cape Town, and some other parts of the west of Cape Colony. In its extreme forms it can be readily distinguished from *B. crenulata* by its small rigid

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* Name from βαρὺς, heavy, and ὀσμή, smell.

† *Betulina*, from the leaves resembling those of the Birch.

‡ These synonyms are referred by Berg to his var. *β obovata* of *B. crenata*, Kunze.

cuneate leaves with their blunt recurved apex and cartilaginous margins set with large spreading denticulations. It must, however, be allowed that plants occur which it is difficult to place in either species, and of these the *B. crenata*, Kunze, with its two forms *ovalis* and *obovata*, seems to be composed.

This shrub was formerly cultivated in our gardens, having been introduced by Masson in 1774, but like many other Cape species has been lost.

Harv. & Sond., Fl. Cap., i, p. 393; Lindley, Fl. Med., p. 213.

Official Part and Names.—Buchu Folia; the dried leaves of Barosma betulina, *Bart.*, Barosma crenulata, *Hook.*, and Barosma serratifolia, *Willd.* (B. P.). The dried leaves (*Barosmæ vel Buchu Folia*) of the above species of Barosma (I. P.). Buchu; the leaves of Barosma crenata, and of other species of Barosma (U. S. P.).

Commerce.—The leaves of the species of Barosma now under notice, as well as of the other official species, are entirely derived from the Cape of Good Hope. In 1873, the total exports from the Cape Colony were about 400,000 lbs., of which nearly 60,000 lbs. were forwarded direct to the United States.

General Characters and Composition.—The general characters and composition of commercial Buchu are described under *Barosma crenulata.* The leaves of *Barosma betulina*, called in the United States Pharmacopœia *B. crenata*, the species now under notice, are commonly less esteemed than those of the other two official species, and are of less commercial value; although Professor Bedford, of New York, found them to yield on an average 1·21 per cent. of volatile oil, whilst the more highly valued leaves of *B. serratifolia* only yielded him 0·66 per cent. Flückiger and Hanbury obtained as much as 1·56 per cent. of volatile oil from the leaves of *B. betulina*; and as Buchu leaves owe their properties, in a great degree at least, to their volatile oil, there is no satisfactory evidence to indicate the inferiority of the present species. The leaves of *B. betulina* are

shorter than the other species, and from this circumstance they are known in commerce as *short buchu,* or from their more usual shape, they have been distinguished as *obovate buchu.* In the British Pharmacopœia they are briefly described as follows: About three quarters of an inch long, coriaceous, obovate, with a recurved truncated apex, and sharp cartilaginous spreading teeth.

Medical Properties and Uses.—Similar to the other species of Barosma: they are described under *B. crenulata.*

Per. Mat. Med., by B. & R., p. 888; Pharmacographia, p. 99; U. S. Disp., by W. & B., p. 182; Royle's Mat. Med., by J. Harley, p. 686; Proceed. Amer. Pharm. Assoc., 1863, p. 211.

DESCRIPTION OF PLATE.

Drawn from a Cape specimen in the British Museum, collected by Auge; the seeds added from Berg and Schmidt.

1. A flowering branch.
2. A branch bearing a solitary fruit.
3. Back view of a flower.
4. Vertical section of same.
5. Diagram of same (the petals should be imbricate).
6. Inside view of a coccus after dehiscence, showing the seed surrounded by the separated inner wall.
7, 8. Seed.
9. A leaf.

(3, 4, 6, 8, 9 enlarged.)

D Blair ad nat del. et lith.

M & N Hanhart imp.

BAROSMA CRENULATA, *Hook*

N. Ord. Rutaceæ.

Tribe *Diosmeæ*.

Genus Barosma, *Willd.*

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46. Barosma crenulata, *Hook., Bot. Mag.*, 3413 (1835).*

Bucchu. Buchu. Bucco. Buku.

Syn.—Diosma crenulata, *Linn., Amœn. Acad.* D. crenata, *Linn., Sp. Plant.* D. odorata, *DC.* D. latifolia, *Lodd.* Barosma odoratum, *Willd.* (name only). B. crenata, *Kunze.* B. Eckloniana, *Berg.* Baryosma odorata & Bucco crenata, *Roem. & Sch.* Parapetalifera odorata, *Bartl. & Wendl.*

Figures.—Nees, t. 377; Bot. Mag., t. 3413; Loddiges' Bot. Cabinet, t. 290; Berg & Sch., t. 1 e; Berg in Bot. Zeitung, 1853, t. xii, figs. A—Q.

Description.—A small bush 3 or 4 feet high, with stiff, slender, somewhat angular branches; bark smooth, reddish-purple; young twigs covered with immersed oil-glands. Leaves opposite or sub-alternate, shortly stalked or rarely sub-sessile, oval, oblong, or rhomboidal-oval, rather thick, glabrous on both sides, bluntish at the apex, narrowed at the base, ¾—1½ inch (usually about an inch) long, with a marked midrib and a few curved lateral veins, finely serrate or crenate-serrate, under surface paler and sprinkled with immersed oil-glands, one of which also stands in each serrature. Flowers solitary, at the ends of short lateral branches and in the axils of their small leaves, the terminal flowers opening first, true pedicels thickened upwards, a little longer than the calyx, with two or three ovate, ciliated, transparent bracts below the flower. Calyx deeply cut into 5 lanceolate-triangular, acute segments, each with a thick midrib and finely ciliated margins. Petals 5, imbricated, two or three times as long as the calyx, ovate, blunt, spreading, glandular-punctate on the back,

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* From an error in the synonymy in the Bot. Mag., it is made to appear that Willdenow is the authority for *B. crenulata*. He has no species with that name.

white, purplish in bud. Stamens 5, hypogynous, alternating with the petals, and ultimately recurved between them over the side of the flower; filaments as long as or longer than the petals, hairy for $\frac{2}{3}$ of their length upwards; anthers 2-celled, innate, roundish; between the stamens and opposite the petals are 5 erect, linear-oblong, blunt, gland-tipped staminodes not half the length of the stamens, slightly hairy. Ovary large, of 5 rounded lobes, each crowned by a spreading, fleshy, pubescent appendage, surrounded at the base by a narrow, prominent, entire disk, 5-celled, with 2—4 ovules in each cell attached to the upper end of the axis; style simple, hairy below, about as long as the stamens; stigma simple, blunt. Fruit of 5 cocci, adherent by their inner margins, about $\frac{3}{8}$ inch long by $\frac{1}{2}$ inch wide, gland-dotted, rugged and warty externally, each coccus terminating at the outer angle above in a projecting ear, and containing a single seed; dehiscence along the summit and ventral suture of each carpel; the inner wall of the pericarp also splitting away from the rest and down its dorsal suture, and forming a hard, smooth, shining, pale yellow, two-lobed envelope to the seed. Seed oblong, rounded at each end, smooth, shining, black, with the hilum white, embryo without endosperm, with large cotyledons and a small superior radicle.

There is a considerable range in the form of the leaves of this species, and, as shown by the synonymy, it has been divided into several. Berg, who has very carefully studied the Buku plants, considers *B. crenata*, Kunze, as distinct, and figures a twig in Berg and Sch., l. c., fig. A 2, and the leaves in his elaborate paper in the Bot. Zeit. quoted below, figs. J—N. He also makes a new species, *B. Eckloniana*, Berg, characterised by the leaves rounded below and the young twigs pubescent, of which a branch and enlarged drawings of the leaves are given in the same paper, figs. O—Q. The present species, *B. crenulata*, Hook., he divides into three varieties, of which the plate in Berg and Sch. represents var. *latifolia*, and figs. A—H in the Bot. Zeitung, vars. *longifolia* and *angustifolia*.

Habitat.—The true Buku bush grows abundantly in stony,

hilly valleys in the western parts of Cape Colony, S. Africa, including the neighbourhood of Cape Town itself and the mountains of Stellenbosch and Worcester. It is a pretty plant, the flowers appearing in spring and lasting a long while. Introduced into England by Masson nearly a century ago, it was cultivated as an ornamental plant for many years, but does not appear to have perfected seed here. Being also difficult to propagate by cuttings, it has now died out in most if not in all of our botanic gardens.

Harv. & Sonder, Fl. Cap., i, p. 393; Berg in Bot. Zeit., 1853, 910; Lindl., Fl. Med., p. 212; Pappe, Fl. Cap. Med. Prodr., ed. 3, p. 7.

Official Part and Name.—Buchu Folia. The dried leaves of Barosma betulina, *Bart.*; Barosma crenulata, *Hook.*; and Barosma serratifolia, *Willd.* (B. P.). The dried leaves (*Barosmæ vel Buchu Folia*) of the above species of Barosma (I. P.). Buchu. The leaves of Barosma crenata, and of other species of Barosma (U. S. P.).

General Characters and Composition.—Buchu leaves are imported from the Cape of Good Hope. Commercial Buchu consists of the leaves of one of the above-mentioned species of *Barosma,* frequently more or less mixed with the flowers, fruits, and stalks of the same plants. The leaves of all the species are smooth, coriaceous, more or less serrate or crenate at their margins, and marked on the edges, and especially on their under surface, with glands filled with essential oil. They have a dull yellowish-green colour, somewhat paler on their under surface; their odour is strong, penetrating, and peculiar, and their taste aromatic, somewhat bitterish, and mint-like.

The leaves of *Barosma crenulata,* the species now under notice, vary in shape and size in different samples, and have been already fully described; from their shape this kind of Buchu is sometimes distinguished as *ovate-oblong Buchu.*

Buchu leaves owe their properties, in a great degree at least, to a powerfully scented *volatile oil,* which, on exposure to cold,

furnishes a kind of camphor termed *barosma camphor*. They also contain abundance of mucilage, which originates as in quince seeds and linseed by solution of the cell-walls. A substance called *Diosmin* or *Barosmin* has also been described by Landerer, but it requires further investigation.

Medical Properties and Uses.—Buchu leaves act as a slight tonic and aromatic stimulant, and are also regarded as diuretic and diaphoretic. Buchu appears also to have a specific influence on the genito-urinary organs. It is given principally in chronic catarrh of the bladder, irritable conditions of the urethra, prostatic affections, gravel, &c. It has also been recommended in chronic rheumatism, dyspepsia, dropsy, and certain cutaneous affections. It is commonly given in combination with alkalies, as solution of potash. The Hottentots esteem buchu highly on account of its odour, rubbing the powdered leaves upon their greasy bodies.

Per. Mat. Med., vol. ii, part ii, p. 400; U. S. Disp., by W. & B., p. 182; Pharmacographia, p. 99; Per. Mat. Med., by B. & R., p. 888; Flückiger, in Schweiz. Wochenschrift für Pharm., Dec., 1873.

DESCRIPTION OF PLATE.

Drawn from Cape specimens collected by Niven, in the British Museum. The seed added from Berg and Schmidt.

1. A flowering branch.
2. Vertical section of a flower.
3. Ripe fruit.
4. Seed.
5. Section of the same.
6. Leaves.

(2—6 enlarged.)

Empleurum serrulatum. Ait.

D Blair ad nat. del. et lith.

M & N Hanhart imp.

BAROSMA SERRATIFOLIA. *Willd*

N. Ord. Rutaceæ.
Tribe *Diosmeæ*.
Genus Barosma, *Willd.*

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47. Barosma serratifolia, *Willd. Enum. Plant, p.* 257 (1809).

Bucchu. Buchu. Bucco. Buku.

Syn.—Diosma serratifolia, *Curtis & others.* Baryosma serratifolia, *R. & S.* Adenandra serratifolia, *Link.* Parapetalifera serrata, *Bartl. & Wendl.*

Figures.—Nees, t. 378; Berg & Sch., t. 2 a; Bot. Mag., t. 456.

Description.—An erect shrub, several feet high, with slender, straight, angular branches; bark smooth, purplish-red. Leaves imperfectly opposite, very shortly stalked, 1 — 1½ inch long, linear-lanceolate, tapering to either end, the actual apex truncate-obtuse, margin sharply and closely serrate with glands in the serratures, under surface paler, with scattered oil-glands, midrib prominent, with 2 or 4 lateral veins, lower pair often running almost to the apex and giving the leaf a 3-ribbed appearance. Flowers as in *B. crenulata,* Hook., but petals always pure white; anthers purple before dehiscence. Fruit and seed as in the other species.

Habitat.—This kind of Buchu grows in the districts of George and Swellendam to the east of Cape Town, in damp situations on the mountain sides. It forms a neater bush than the other species, and was at one time in cultivation in England as a green-house shrub; specimens in flower from Kew Gardens, 1795, are in the British Museum. From *B. crenulata* the longer leaves with a blunt point are a ready distinction.

An allied Rutaceous shrub, *Empleurum serrulatum,* Ait., is sometimes imported as Buchu. Its leaf bears a strong similarity to that of *B. serratifolia,* but is much longer and narrower, with the sides parallel, the denticulations coarser, and the apex very acute.

Empleurum is quite different in floral structure, being apetalous, with large erect red anthers, and a monocarpellary horn-shaped fruit; it is well and completely figured in Berg and Schmidt, t. 2 b.

Harv. & Sond., l. c., p. 393; Lindley, Fl. Med., p. 213.

Official Part and Names.—Buchu Folia; the dried leaves of Barosma betulina, *Bart.*, Barosma crenulata, *Hook.*, and Barosma serratifolia, *Willd.* (B. P.). The dried leaves (*Barosmæ vel Buchu Folia*) of the above species of Barosma (I. P.). Buchu; the leaves of Barosma crenata, and of other species of Barosma (U. S. P.).

General Characters, Composition, and Commerce.—The general characters, composition, and commerce of Buchu have been already given under *Barosma betulina* and *Barosma crenulata.* The leaves of *Barosma serratifolia,* the species now under notice, are not liable to any great variation in size and shape, like those of the *B. crenulata,* and have been already fully described. From their length they are known in commerce as *long buchu.* In the British Pharmacopœia their characters are shortly given as follows:—"From an inch to an inch and a half long, linear-lanceolate, tapering at each end, sharply and finely serrated, three-nerved." From the shape of the leaves, this kind of Buchu is sometimes distinguished as *linear-lanceolate Buchu.*

Substitute.—The leaves of *Empleurum serrulatum,* Ait., a small shrubby plant, of the same natural order as *Barosma,* and inhabiting the same district, are not unfrequently imported and sold as Buchu. They are readily distinguished, as is indicated in the accompanying plate of *Barosma serratifolia,* by being narrower and longer; and likewise by their different odour. They also terminate in an acute point without an oil-gland; whereas the leaves of *Barosma serratifolia* are blunt or somewhat truncate, and always provided with an oil-gland at the apex.

Medical Properties and Uses.—Similar to the other species;

they have been already referred to under the head of *Barosma crenulata*.

Per. Mat. Med., vol. ii, pt. 2, p. 399; Pharmacographia, p. 101; Gmelin's Chemistry, vol. xviii, p. 194; U. S. Disp., by W. and B., p. 183.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum, collected by Bowie at Knysna, George, Cape Colony.

1. A flowering branch.
2. A flower.
3. A leaf.

(2 and 3 enlarged.)

PILOCARPUS PENNATIFOLIUS, *Lem.*

M&N Hanhart imp.

N. Ord. Rutaceæ.

Tribe *Xanthoxyleæ*.

Genus Pilocarpus,* *Vahl.* B. & H. Gen., i, p. 299; Baill., Hist. iv, p. 475. Species about 12, natives of tropical South America, including the West Indies.

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48. Pilocarpus pennatifolius, *Lemaire, Jardin Fleuriste,* iii, t. 263 (1852).

Pernambuco Jaborandi.

Syn.—P. pinnatus, *Martius.* P. Selloanus, *Engler ?*

Figures.—Jardin Fleuriste, iii, t. 263; Fl. Bras., fasc. 65, t. 30 (*P. Selloanus*); Pharm. Journ., 1875, p. 582 (leaf and fruit).

Description.—A shrub about 4 or 5 feet high or more, slightly branched, branches erect, bark rather smooth, grey with white dots, the young parts with a rufous pubescence. Leaves alternate, without stipules, long-stalked, petiole swollen at the base, imparipinnate, 1—1½ feet long; leaflets opposite or sub-opposite, in 2—5 pairs and a terminal one, sometimes unequal, very shortly stalked, 3½—4 inches long, oval-oblong, rounded or tapering and often slightly unequal at the base, very obtuse rounded or emarginate at the apex, entire, the margin slightly revolute, coriaceous, glabrous except when young bright green and shining above, paler often pilose and with a very prominent midrib below, dotted with minute impressed glands which show as pellucid dots when held against the light. Flowers rather small, numerous, on rather thick, slightly pilose pedicels about ¼ inch long, laterally dilated and compressed at the base, and spreading horizontally from all sides of a thick, cylindrical, elongated, tapering, dark green, somewhat furrowed, pilose peduncle, apparently terminating a branchlet, the whole forming a very narrow, lax, spicate, erect raceme 18 inches or more in length, bracts wanting at the base of the pedicels, but each with two small triangular bractlets beneath

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* *Pilocarpus,* apparently from πῖλος, a hat, and καρπός, fruit; but the connection does not readily suggest itself.

the calyx. Calyx small, slightly pilose, shallowly cut into 5 very broad, acute, faintly ciliated segments. Petals 5, spreading and star-like, valvate in the bud, lanceolate, acute, slightly inflexed at the margin, thick and leathery, dotted with minute sunk glands, smooth, dark reddish-purple. Stamens 5, hypogynous, filaments shorter than the petals, purple; anthers rather large, 2-celled, cordate at the base, introrse, yellow. Carpels 5, the ovaries free but in contact by the ventral edges and sides, immersed and partially covered in by the large, soft, cushiony, somewhat lobed, purple disk, which also projects laterally over the origin of the petals and stamens; ovules 2 in each ovary. Styles arising from the ventral side, coherent, short, erect; stigma terminal. Fruit (of Jaborandi) of 5 carpels, but one or more usually partially or completely abortive, spreading in a circle round the hard axis, about $\frac{1}{2}$ inch in length, somewhat laterally compressed, keeled along the upper edge, rounded on the back, pale yellowish-brown; pericarp thin, hard and woody, marked on the sides with curved, blunt ridges, and dotted with a few large, prominent oil-glands, glabrous when mature, dehiscent along the upper and outer edges and gaping open, the inner wall (endocarp) also splitting away and forming a 2-lobed, smooth, hard, shining, elastic, pale yellow loose envelope to the seed. Seed solitary in each carpel, attached to the top of the inner edge of the endocarp, somewhat reniform and compressed, smooth, black and shining; hilum small; cotyledons large, radicle short, no endosperm.

Habitat.—This species is a native of Brazil, and was first found in the southern provinces of Mato Grosso and S. Paulo, whence it was introduced into Europe in 1847, and is now cultivated in various botanical gardens on the Continent and in England. It also grows in the hotter northern provinces of Ceara and Piauhy, especially in the neighbourhood of Pernambuco, where it is found in the forest-clearings on the slopes of the hills. It flowers in spring and early summer.

The determination of the source of the ordinary Jaborandi of commerce was made early in 1875 by Prof. Baillon, of Paris, who, from an examination of the leaves alone, was able to refer it to

the genus *Pilocarpus*, and with less certainty to the present species. In the same year the examination of the fruit by Mr. Holmes conclusively fixed the generic position; but in the absence of good flowering specimens it is not even yet possible to state, with complete certainty, that it is *P. pennatifolius*, of which species the fruit is not known to botanists, and cannot therefore be compared.

In the recent revision of the Brazilian species of the genus by Engler, a plant from some part of southern Brazil is described under the name of *P. Selloanus* which, as far as leaves go, agrees still more closely with Jaborandi; of this also the fruit is unknown. We have above doubtfully placed this latter species as a variety, since its characters as at present known scarcely seem to warrant specific separation from *P. pennatifolius*; the leaves of the latter vary considerably in the number of leaflets and amount of hairiness, being often perfectly glabrous on both surfaces, but the pedicels of *P. Selloanus* are certainly longer, thinner, and less horizontal. Prof. Baillon is now of opinion that both these species or varieties afford Jaborandi, and he states that M. Balansa has seen *P. Selloanus* collected near Assomption for export to Europe.

The "hairy variety" mentioned by Mr. Holmes, which has leaflets of a considerably thinner texture, with the midribs, as well as the rachis and young branches, densely clothed with short rufous hairs, may possibly belong to a different species.

Jaborandi is a comprehensive name in South America, and is applied to several other plants of very different affinities. A species of pepper, *Piper Jaborandi*, Vell., is especially so designated. It is figured in the Flora Brasiliensis, fasc. ii, t. 32.

Lemaire, loc. cit.; Engler, in Fl. Brasil., fasc. 65, 136, 138; Holmes, in Pharm. Journ., 1875, pp. 581 and 641; Hardy, in Bull. d'Acclimat., 1876, p. 671, transl. in Pharm. Journ., 1876, p. 496; Stiles, in Pharm. Journ., 1877, p. 529; Lanessan, in Hist. des Drogues, p. 250 (1877); Baillon, in Bull. Mens. Soc. Linn. Paris, 1878, p. 149.

Parts Used and Name.—JABORANDI; the leaves and young shoots.

It is not official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United States.

Kinds of Jaborandi and History.—It appears that under the name of Jaborandi or Jamborandi a number of drugs of vegetable origin are employed in Brazil for their sialagogue and diaphoretic properties. Thus, Dr. Peckolt has enumerated the following plants of the order Piperaceæ as yielding varieties of Jaborandi, namely, *Serronia Jaborandi,* Guill., *Piper Jaborandi,* Vell., which he regards as the true Jaborandi plant; *Piper nodulosum,* Lk., *Piper reticulatum,* Linn., and *Artanthe mollicoma,* Miq.; also *Aubletia trifolia,* Rich., of the order Rutaceæ; and *Xanthoxylum elegans,* Engl., of the order Xanthoxylaceæ. Other plants have also been mentioned by Martius and others as having received similar names. The kind of Jaborandi now under consideration was first introduced to the notice of the medical profession in Europe by Dr. Coutinho, of Pernambuco, who gave specimens of the drug to Professor Gubler, of Paris, and he tested its physiological action and uses in the Beaujon Hospital, and fully confirmed the opinion entertained by Dr. Coutinho of its being a very energetic diaphoretic and sialagogue. Since the introduction of this new remedy, which was in the early part of the year 1874, it has been experimented upon by Martindale, Ringer, Gould, Murrell, Grebler, Craig, Vulpian, Feréol, Rabuteau, Hardy, and others, who all agree in stating that it is a powerful and direct diaphoretic. Its practical value as a remedial agent is, therefore, now undergoing investigation.

General Characters and Composition. — The botanical characters of this variety of Jaborandi have been fully given in our description of the plant, and these will therefore readily enable any one to distinguish it from the other kinds. The dried leaves, at least those we have examined, have no very evident odour when entire, but when bruised they are faintly aromatic. Martindale, however, has described them as having a very characteristic odour, which he regards as resembling a mixture of Indian hemp, matico, and cubebs. Their taste is but feeble at first, but on chewing they are somewhat aromatic

and very slightly bitter, and produce a peculiar warm tingling sensation in the mouth, accompanied by an increased flow of saliva. The effect thus produced much resembles that caused by chewing pellitory root. The bark has a similar taste and odour to the leaves, but is somewhat more pungent.

Jaborandi has been chemically examined by Rabuteau, Byasson, Gerrard, Hardy and Rochefontaine, Schaer, Kingzett, and other chemists. Rabuteau, who first operated on the drug, but in too small a quantity for his experiments to be regarded as conclusive, believed the odour to be due to a volatile principle, but not analogous to the essential oils contained in aromatic plants; and the bitter taste to a principle soluble in water and alcohol, and easily separated by heating the aqueous extract with alcohol. He also thought that no alkaloid was present. Subsequently, Byasson obtained results which appeared to prove both the presence of a volatile oil and a volatile alkaloid. The presence of an alkaloid was afterwards distinctly established by Gerrard and also by Hardy. The alkaloid thus obtained has been proved to possess well-marked chemical and physiological properties, and although non-crystalline in itself, it is capable of forming with acids crystalline salts. It is soluble in water, alcohol, and chloroform. Some chemists describe pilocarpine as crystalline; it requires further investigation. Gerrard characterises the hydrochlorate as a deliquescent salt, soluble in alcohol; and the nitrate as a stable compound, soluble in water, and sparingly in cold, but freely in boiling alcohol. This alkaloid is to be regarded as the active principle of Jaborandi; and has therefore been termed *Pilocarpine* or *Pilocarpia*. A simple method of obtaining it, according to Hardy, is to make an infusion of the leaves, reduce it to a syrupy consistence, mix it with excess of magnesia, evaporate to dryness, treat the mixture with chloroform, evaporate the chloroform, and take up the residue with water. Upon placing the solution in a vacuum, the water is disengaged, and the base remains in a free state as a colourless viscous mass, soluble in water and alcohol. Kingzett has also examined this alkaloid, and described its chemical composition; he has also shown that Jaborandi contains only one alkaloid.

Besides *pilocarpine*, Jaborandi contains a *volatile oil, various salts,* and other substances of little or no importance. The volatile oil is described by Hardy as consisting of a hydrocarbon boiling at about 352°, a substance passing over at 492°, and a third product, which was distilled at a still higher temperature, and after a time formed a solid transparent mass. The hydrocarbon, boiling at about 352°, has been termed by Hardy *pilocarpene*. It is described as a colourless, transparent, mobile liquid, having a peculiar and rather agreeable odour, a specific gravity of about 0·852 at 65°, and dextrogyre.

Medical Properties and Uses.—As already noticed, the experiments of numerous observers prove that Jaborandi is an energetic diaphoretic and sialagogue. The physiological experiments of Murrell, Hardy, and others have also demonstrated that pilocarpine is an energetic agent. In some experiments with the pilocarpine of Gerrard, Murrell found it to be specifically antagonistic to atropia. Murrell concluded from his experiments that the alkaloid is clearly capable of producing in a very much smaller dose the full effects obtained by the use of the drug itself. In large doses Jaborandi produces nausea and occasionally emesis; but it is conjectured by Dr. Merkel, that the latter effect may be caused by swallowing the saliva. It also causes diarrhœa. Merkel found that the action of Jaborandi varied upon different individuals, some not perspiring at all under its use, although readily perspiring by means of other agents; hence the drug, he adds, cannot be regarded as a specific. In a drug of such potency it might be expected that we should possess a new and valuable substance in the treatment of disease; but even in Brazil, where its properties are well known, it does not appear to be applied to any great extent as a remedial agent; and its use in this country and other parts of Europe have, at present, not been followed by any very important results. Dr. Gubler, who first tried it in the Beaujon Hospital in Paris, considers that it will be used with advantage in a great number of morbid states, differing much among themselves in nature and gravity, but presenting the common necessity for

stimulating the secretory action of the skin and salivary glands. Harley likewise states "that diseases associated with or dependent upon imperfect action of the salivary glands and the skin are those which we may expect to be benefited by its use." It has also been employed by Ringer and Gould to increase the secretion of milk.

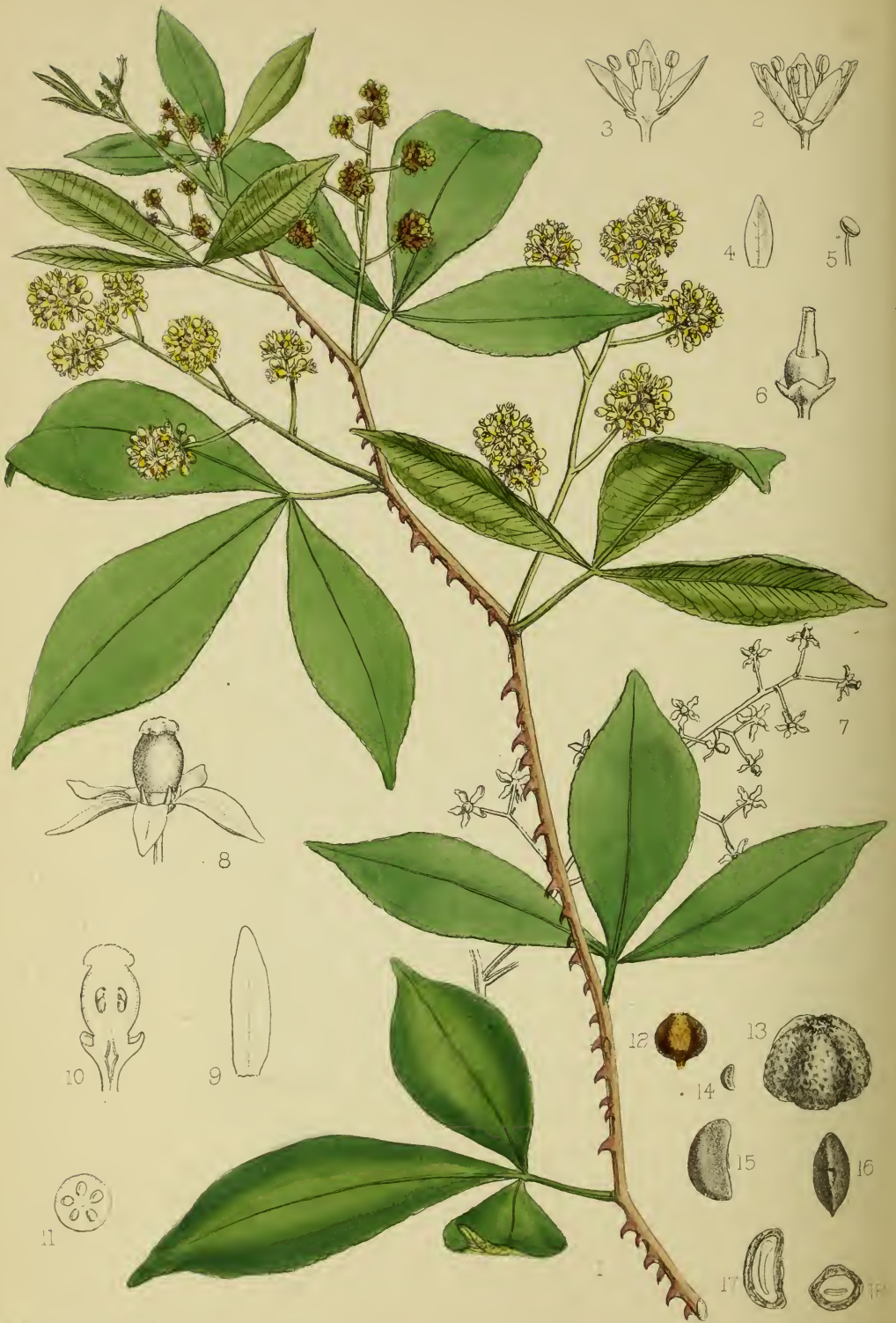
Royle, Mat. Med., by J. Harley, p. 682; Pharm. Journ., ser. 3, vol. iv, p. 850, from Repertoire de Pharmacie, vol. ii, p. 171, also, Rabuteau on the Chemical Analysis of Jaborandi p. 911, from L'Union Pharmaceutique, vol. xv, p. 120; Martindale, in Ph. Jl., vol. v, ser. 3, pp. 364 & 561; Holmes, in Pharm. Jl., vol. v, ser. 3, p. 581, with figure, & pp. 641 & 781; Byasson, in Pharm. Journ., vol. v, ser. 3, p. 826, from Repertoire de Pharmacie, March 25, 1875; Murrell, in Pharm. Journ., vol. vi, ser. 3, p. 228; Gerrard, in Pharm. Journ., vol. v, ser. 3, pp. 865 & 965, & vol. vi, p. 227; Kingzett, in Pharm. Jl., vol. vi, ser. 3, p. 1032, & vol. viii, p. 255; Hardy, in Pharm. Journ., vol. vi, ser. 3, p. 565, & vol. vii, p. 496; Proc. Amer. Pharm. Assoc., vol. xxiii, pp. 180—188, vol. xxiv, pp. 160—165, & vol. xxv, p. 175; Year Book of Pharmacy for 1875, pp. 164—183, for 1876, p. 529, & for 1877, pp. 208 & 615; Amer. Journ. Pharm., 1877, p. 395.

DESCRIPTION OF PLATE.

Drawn from a specimen sent from the Botanic Garden at Lisbon by Dr. E. Goeze, the fruit added from a specimen in the possession of Mr. Holmes.

1. A branch with raceme of flowers.
2. A petal.
3. Vertical section of a flower.
4. A flower.
5. A bud.
6. A fruit.
7. A single carpel.
8. Endocarp.
9, 10. Seeds.
11. Vertical section of the same.

(2–5 enlarged.)



D.Blair ad nat. del. et lith
M&N Hanhart

TODDALIA ACULEATA *Pers.*

N. Ord. Rutaceæ.

Tribe *Toddalieæ*.

Genus Toddalia,* *Juss.* B. & H., Gen., i, p. 300; Baill., Hist. Pl., iv, p. 483. Species about 8 (including *Vepris*), natives of tropical Asia and Africa.

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49. Toddalia aculeata, *Persoon, Synopsis,* i, *p.* 249 (1805).

Syn.—Paullinia aculeata, *Linn.* Toddalia asiatica, var. *Baill.* Scopolia aculeata, *Smith.*

Figures.—Rheede, Hort. Malabar., v, t. 41; Burman, Fl. Zeylan., t. 24; Wallich, Plant. Asiat. Rar., iii, t. 232; Wight, Illust. Ind. Bot., t. 66; Beddome, Fl. Sylvat. Anal. Gen., t. vi, f. 5.

Description.—A straggling woody plant, usually a shrub, but often climbing over tall trees, with slender, much-branched, tortuous stems, the younger branches usually provided with more or less numerous small, strong, recurved, sharply hooked, orange-coloured prickles; bark soft, greyish-brown; buds slightly tomentose. Leaves alternate, without stipules, on petioles ½—1 inch long, often with hooked prickles on their back, trifoliolate, leaflets 1½—2½ inches long, sessile, oblong-oval or lanceolate, rather suddenly narrowed into an attenuate blunt point, tapering at the base, faintly crenulate, the margins sometimes revolute, quite smooth and green on both sides, thick, punctate with minute glandular dots, shining above, dull and with prominent veins beneath. Flowers sub-unisexual, very small, numerous, stalked, arranged in small, stalked, umbellate clusters of 6—12 on the divaricate slender branches of lax, elongated, paniculate cymes from the axils of the leaves; the female flowers somewhat larger, much less numerous, and in laxer clusters. Male flowers:—Calyx very small, cut into 5 shallow, broad, acute lobes; petals 5, spreading, oblong-lanceolate, acute, thick, white, valvate; stamens 5, alternate with the petals, and about equal to them in length, hypogynous, filaments subulate, anthers dorsifixed, oblong; abortive pistil small, surrounded at the base by a large fleshy disk.

* From the Malabar name, *Koka-Toddali.*

Female flowers :—Calyx as in the male ; petals longer, narrower, and more spreading ; stamens reduced to 5 very short pointed filaments ; ovary large, ovoid, dotted with immersed glands, elevated on a short gynophore, 5-celled, with 2 ovules in each cell, style none, stigma capitate, fleshy. Fruit about the size of a pea, depressed, globose, 5-lobed ; pericarp soft, leathery, orange-brown, covered with small pits, 5-celled, with a single seed in each cell. Seeds subreniform, compressed, rounded on the back, sharp in front, testa thick, embryo slightly curved in the axis of fleshy endosperm.

Habitat.—A common plant in Southern India, especially on the Coromandel Coast, but extending as far north as Nepal. It grows also in Ceylon, Java, and other Malayan islands, and South China, as well as in Bourbon and Mauritius, where, from the shape of the leaves, it is called *Patte de Poule.* It delights in a rich soil, and grows either as a bushy much-branched shrub or as a scrambling climber over even high trees. It is very variable in leaf-form, inflorescence, and armature. The prickles seem only to be largely developed when the plant is scandent, and are often quite absent when the plant grows as a bush.

The plant has been introduced here into our botanical gardens, and is in cultivation at Kew.

Roxb., Fl. Ind., i, p. 616 ; DC. Prod., ii, p. 83 ; Hook. f., Fl. Brit. Ind., i, p. 497 ; Lindl., Fl. Med., p. 218 ; Brandis, Forest Flora, p. 46 ; Benth., Fl. Hongkong., p. 59.

Official Part and Name.—Toddaliæ Radix ; the root-bark (I. P.). It is not official in the British Pharmacopœia or the Pharmacopœia of the United States. But a root was official in the Edinburgh Pharmacopœia of 1792 under the name of *Radix Indica Lopeziana,* which was derived from this and other species of *Toddalia.*

General Characters and Composition.—The name of *Lopez root* by which it was formerly known in Europe is derived from a Portuguese, who, according to an Italian physician, named Redi, found it growing in Zanzibar, on the East Coast of Africa. As

Toddalia aculeata is not, however, a native of Africa, it is probable that the plant alluded to by Redi is *Toddalia lanceolata*, Lam., which has been found growing at the mouth of the river Zambesi by Dr. Kirk. Toddalia root is found in cylindrical, more or less twisted, and frequently branched pieces, of several inches in length, and varying from about half an inch to two inches or more in diameter. It is covered with a closely adhering bark which varies from about $\frac{1}{8}$ to $\frac{1}{12}$ of an inch in thickness. The wood is dense, hard, pale yellow or whitish, and without taste or smell. The bark is covered by a soft, velvety and corky outer layer, which is wrinkled longitudinally, and of a dull yellow colour; beneath which is a thin layer of a bright yellow colour, and underneath this and constituting at least two thirds of the whole bark, is a firm brown-coloured portion, which essentially consists of the liber and middle cortical layer of the bark. The bark has no very marked odour; but a bitter, pungent, and aromatic taste. It is the only part which should be used in medicine; and for this purpose it is shaved or rasped from the wood; it retains its bitterness and pungency for a long time. The fresh root-bark is, however, regarded as the most active.

No satisfactory analysis of toddalia root has as yet been made; but it contains a *volatile oil* and a large amount of *resin*.

Medical Properties and Uses.—Toddalia root under the name of Lopez root was formerly esteemed in European practice as a remedy for diarrhœa, but has long fallen into disuse. It is, however, regarded in India as a valuable stimulating tonic; it first obtained its reputation as a remedy in the remittent jungle fever, commonly known as hill-fever. Dr. Bidie, of Madras, says he knows no single remedy in which active stimulant carminative and tonic properties are so happily combined as in this drug. Waring says, that "in constitutional debility, and in convalescence after febrile and other exhausting diseases, it is apparently a remedy of great value." It is worthy of trial in this country. In India it is usually administered in the forms of tincture and infusion; and formulæ for these preparations are given in the Pharmacopœia of India.

Murray, Apparatus Medicaminum, Edin., 1792, vol. vi, p. 164; Woodville's Med. Bot. Supplement, p. 169; Guibourt, Hist. des Drog. Simp., vol. ii, p. 530; Royle's Illust., p. 157; Pharmacographia, p. 101; Pharmacopœia of India, pp. 47 and 442.

DESCRIPTION OF PLATE.

Drawn from specimens in the British Museum collected in Java by Horsfield and in Ceylon by Thwaites.

1. A flowering branch with male inflorescence.
2. A male flower.
3. Section of the same.
4. A petal.
5. A stamen.
6. Abortive pistil.
7. Panicle of female flowers.
8. A female flower.
9. A petal.
10. Vertical, and—11. Transverse section of ovary.

12, 13. Fruit.

14, 15, 16. Seeds.

17. Vertical, and—18. Transverse sections of the same.

(2—6, 8—11, 13, 15—18 enlarged.)

LITHUS VULGARIS *Risso*

M & N Hanhart

N. Ord. RUTACEÆ.

Tribe *Aurantieæ*. Lindl., Veg. Kingd., p. 457; Le Maout & Dec., p. 318.

Genus Citrus,* *Linn.* B. & H., Gen., i, p. 305; Baill., Hist. Pl., iv, p. 488. Species about 5, natives of the warmer parts of Asia, but some now cultivated over the globe.

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50. Citrus vulgaris, *Risso in Ann. du Muséum*, xx, *p.* 190 (1813).

Bitter Orange. Seville Orange. Bigarade Orange.

Syn.—C. Aurantium, *Linn.* (in part). C. Bigaradia, *Duhamel.*
Figures.—Steph. & Ch., t. 14; Risso, Hist. Orangers, tt. 30—52; Nouveau Duhamel, vii, tt. 25, 34.

Description.—A rather smaller tree than the common orange, with a straight stem and dense head of tufted branches; bark grey, young shoots pale green. Leaves as in the common orange, but with the wing of the petiole usually rather broader and the spines somewhat longer. Flowers as in the last, but generally rather larger. Fruit somewhat rougher, darker in colour, often nearly red, and with the rind and pulp very bitter.

Habitat.—What is said under the sweet orange, *C. Aurantium* (see No. 51), applies equally to the present plant; indeed, the two are separable by no characters of importance and are obviously forms of one species, though considered quite distinct by cultivators. The flowers of the present plant are more strongly scented and the glands in the rind are described as concave on the surface, instead of convex as in the orange.

The Bitter Orange is very extensively grown in the warmer parts of the Mediterranean, especially in Spain, and also in Madeira, India, China, &c. There are specimens in the gardens at Chelsea and at Kew.

Among the very numerous varieties of this orange found in cultivation may be especially mentioned the small round fruited Mandarin orange, cultivated in South Europe (*C. sinensis*, Willd.),

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* *Citrus, citrum*, or *citrium*, in Greek κίτριον, the classical names for the Citron, *C. medica* (see No. 53).

and the pretty small-leaved and very small-fruited variety *myrtifolia* (figured in the 'Bot. Register,' t. 346). The celebrated *Bizarria* of Italy, which produces oranges, lemons and citrons, and even occasionally fruits combining parts of each, on the same plant, is a curiosity resulting from skilful cross-grafting and hybridizing. It is figured in 'Nouveau Duhamel,' vii, tt. 36, 37.

The shaddock, *C. decumana*, Willd., is considered to be a distinct species by Brandis. It appears native to Polynesia and Java. Other botanists regard it as another variety of *C. Aurantium*, Linn.

Hook. f., Fl. Brit. India, p. 515; Brandis, Forest Flora, p. 52; Lindl., Fl. Med., p. 163.

Official Parts and Names.—1. Aurantii Fructus; the ripe fruit of Citrus Bigaradia, *Risso*: 2. Aurantii Cortex; the dried outer part of the rind of the bitter orange, Citrus Bigaradia, *Risso*: 3. Aqua Aurantii Floris; the distilled water of the flowers of the Bitter Orange tree, Citrus Bigaradia, *Risso*, and of the Sweet Orange tree, Citrus Aurantium, *Risso* (B. P.). In the Pharmacopœia of India, Citrus Aurantium, *Linn.*, is called the Sweet and Bitter Orange tree, and the dried outer portion of the rind of the fruit, that of the Bitter Orange to be preferred; and Orange Flower Water, are official. 1. Aurantii Amari Cortex; the rind of the fruit of Citrus vulgaris: 2. Aurantii Flores; the flowers of Citrus Aurantium and Citrus vulgaris (U. S. P.).

1. Aurantii Fructus.—The ripe fruit, under the name of the *Bitter Orange*, was introduced into Additions to the British Pharmacopœia, published in 1874, as the source of Fresh Orange Peel, of which a Tincture was then ordered for the first time. The characters of the fruit are noticed in our botanical description. It is imported from the South of Europe, and is known in London as the Bitter Orange, or the Seville Orange.

2. Aurantii Cortex; Aurantii Amari Cortex.—*Preparation and General Characters.*—Bitter Orange Peel of the British Pharmacopœia and the Pharmacopœia of India is the dried outer part of the rind from the ripe fruit; but in the Pharmacopœia of the United States the rind of the fruit is simply ordered.

The peel is removed from the ripe fruit by cutting it with a sharp knife in one long spiral piece, care being taken to cut it thin so as not to include any more of the inner white portion than can be helped. It is then dried; or it is sold in a fresh state. Dried peel is also largely imported, more especially from Malta, but it is regarded as inferior to that dried in England.

Bitter Orange Peel, as thus obtained, is in thin slices of a bright dark orange colour externally, and whitish internally, having an aromatic bitter taste, and pleasant aromatic odour.

Composition.—The principal constituents are a *volatile oil*, and a bitter principle, termed *hesperidin*, which is said to be most abundant in the peel of the unripe bitter orange; but of it little is positively known. The volatile oil is referred to in describing *Aurantii Dulcis Cortex* under *Citrus Aurantium*.

Medical Properties and Uses.—Bitter Orange Peel is a bitter aromatic tonic and stimulant. It is a pleasant addition to other bitters, and as a vehicle for the exhibition of other medicines. The tincture made from the recent peel has a more agreeable flavour, and is stronger than that prepared from the dried rind, hence its recent introduction into the Additions to the British Pharmacopœia. In the United States bitter orange peel is preferred for its tonic properties; and sweet orange peel as a flavouring agent. The latter is described under *Citrus Aurantium*.

Bitter orange peel is also used for flavouring Curaçoa, and in the preparation of *Candied Orange Peel*, and for other purposes.

3. Aqua Aurantii Floris.—Orange Flower Water, and Oil of Neroli, to which its properties are essentially due, are described by us in treating of *Aurantii Flores*, under *Citrus Aurantium*.

The other products of the Bitter Orange tree are also noticed under *Citrus Aurantium*.

Per., Mat. Med., by B. & R., p. 915; Pharmacographia, pp. 111—115; U. S. Disp., by W. & B., p. 158; Gmelin, Chemistry, vol. xiv (1860), p. 305; Wright and Piesse, in Year Book of Pharmacy, 1871, p. 546, and 1873, p. 518; Bentl., Man. Bot., p. 464.

DESCRIPTION OF PLATE.

Drawn from a specimen cultivated in the Royal Gardens, Kew.

1. A branch with flowers.
2. A fruit.
3. Vertical section of the same.

2
3
4
1
5
6
7

N. Ord. Rutaceæ.
Tribe *Aurantieæ*.
Genus Citrus, *Linn.*

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51. Citrus Aurantium,* *Risso, in Ann. du Museum*, xx, *p.* 181, (1813).

Orange. Sweet Orange. China Orange. Portugal Orange.

Syn.—C. Aurantium, *Linn.* (in part).

Figures.—Woodville, t. 188; Hayne, xi, t. 28; Nees, t. 425; Risso, Hist. Orang., tt. 3—39.

Description.—A small tree, rarely reaching 20 feet in height, with an upright trunk much branched above, the branches spreading into a regularly shaped, more or less spherical head; bark smooth, greyish-brown on the older branches, dull whitish-green on the younger ones. Leaves evergreen, alternate, often with short, solitary, sharp spines in the axils; blade oval or ovate-oblong, acute, 3 or 4 inches long, smooth, shining, dark green, paler below, entire or faintly serrate, articulated on the petiole, which is ½—1 inch long and more or less broadly winged. Peduncles solitary, axillary, usually 1-flowered, sometimes 2- to 6-flowered, smooth, generally shorter than the petiole. Calyx cup-shaped, with 5 short, broad, acute teeth, thick, pale green, persistent. Petals 5, oblong, 1—1¼ inch long, thick and fleshy, blunt, brilliant white, with yellowish sunken glands on the back, strongly recurved. Stamens 20—25, hypogynous, filaments unequal, flattened, often united at the base in threes or fours, shorter than the petals; anthers oblong-linear, versatile, bright yellow. Ovary cylindrical, striated longitudinally, with numerous oil-glands below the epidermis, surrounded at the base by a swollen, prominent, rounded disk, 8- or more celled, with several anatropous ovules in each cell attached in two rows to the axile

* The mediæval name for the fruit; also written *arantium*, and, like the English word *Orange*, from the Sanskrit *Nagaranga*, through the Arab *Naranj*.

placentæ; style thick, nearly as long as the stamens; stigma rounded, channeled. Ripe fruit, a large round berry somewhat compressed at its two ends, usually 9—11-celled, the loculi packed with a soft tissue of large irregular, fusiform, horizontal, loosely connected cells or vesicles, filled with a sweet juice, the dissepiments very thin, membranous, the axis spongy; pericarp thin, spongy, externally smooth, slightly irregular from the projection of the numerous crowded oil-cysts below the epidermis, rich orange yellow. Seeds several in each cell, horizontal, loose in the pulp, about $\frac{3}{4}$ inch long, oblong-ovoid, somewhat compressed, usually with a blunt point at the apex above the chalaza, and somewhat truncate at the hilum; testa soft, pale yellow, veiny; embryo of two large, unequal, irregular, thick, plano-convex cotyledons and a small, superior radicle; endosperm none; not very unfrequently two embryos are produced in a single seed.

Habitat.—The sweet orange can scarcely be said to be known in a wild state, but all circumstances appear to concur in pointing to Northern India, or possibly to Southern China as its original home. It was unknown to the Greek and Roman writers, and, indeed, was not introduced into Europe till about the middle of the 15th century by the Portuguese. It is now sparingly cultivated in India, but very abundantly in many parts of the Mediterranean district, and in Spain, Portugal, Madeira, the Azores, and China. Numerous varieties are distinguished by cultivators, no less than 44 being described, and most of them beautifully figured in Risso's sumptuous 'Histoire des Orangers,' the differences residing almost entirely in the form, colour, &c., of the fruit. In the South of Europe the trees are in full flower in April and May, and the fruit, which takes a year or more to ripen, is in perfection at much the same time. The tree is familiar enough in our greenhouses, where it fruits pretty freely, but English-grown oranges want the sweetness of those of southern climes.

Hook. f., Fl. India, i, p. 515; Brandis, Forest Fl., p. 53; Lowe, Fl. Madeira, i, p. 73; Lindl., Fl. Med., p. 163.

Official Parts and Names.—The Flowers only are official in the British Pharmacopœia as follows:—Aqua Aurantii Floris. The distilled water of the flowers of the Bitter Orange tree, Citrus Bigaradia, *Risso;* and of the Sweet Orange tree, Citrus Aurantium, *Risso.* In the Pharmacopœia of India, under the head of Citrus Aurantium, *Linn.*, which is called the Sweet and Bitter Orange tree, both the dried outer portion of the rind of the fruit (*Aurantii Cortex*) and Flowers are mentioned, but the flowers of the Sweet Orange are alone directed to be used in the preparations of that volume. 1. Aurantii Flores. The flowers of Citrus Aurantium and of Citrus vulgaris; 2. Aurantii Dulcis Cortex. The rind of the fruit of Citrus Aurantium (U. S. P.).

1. Aurantii Flores. *Orange Flowers.*—Orange flowers are white when fresh, but become yellowish on being dried. They have a fragrant odour which is most powerful in the fresh flowers.

Production of Orange Flower Water.—By distilling the fresh flowers with water in the ordinary way, *Orange Flower Water* passes over, together with a volatile oil called *Oil of Neroli,* which floats on the surface. When the oil is removed we have the *Aqua Naphæ* or *Orange Flower Water* of commerce. This is commonly prepared in the South of France at Grasse, Cannes, and Nice; it is, however, generally distilled from the flowers of the bitter orange, which are regarded as yielding the most fragrant product.

General Characters and Composition of Orange Flower Water.—Orange flower water is nearly colourless, or with a slight greenish-yellow tint. It has a very fragrant odour and a bitter taste. From being distilled or kept in copper or lead vessels it sometimes contains metallic impurity; hence the test of the British Pharmacopœia:—"Not coloured by sulphuretted hydrogen." Orange flower water also frequently contains some of the distilled water of orange leaves, for these, like orange flowers, yield by distillation a water and a volatile oil called *Essence de Petit Grain.* The perfume of these are, however, far less sweet than the similar products of the flowers.

The odour of orange flowers is due to the volatile oil they contain. This, as already stated, is called *Oil of Neroli.* It is regarded by Soubeiran as a product of the distillation rather than as pre-existing in the flowers. When pure, according to the authors of *Pharmacographia,* "it is of a brownish hue, most fragrant odour, bitterish aromatic taste, and is neutral to test-paper. When mixed with alcohol, it displays a bright violet fluorescence, quite distinct from the blue fluorescence of a solution of quinine." By distillation the authors obtained from the oil a very small amount of the kind of camphor called *Neroli Camphor;* and they state further that they were unable to obtain any similar substance from the oils of bergamot, petit grain, or orange peel.

Medical Properties and Uses.—In its action orange flower water is regarded as a slight nervous stimulant, and on the Continent of Europe dried orange flowers are thus employed in the form of infusion; but in this country, and in the United States of America, orange flower water is only used in medicine on account of its agreeable odour, and as a flavouring agent.

Oil of Neroli is chiefly employed in perfumery, and, to some extent, in the preparation of *liqueurs.* It is one of the ingredients of Eau de Cologne.

2. Aurantii Dulcis Cortex. *Sweet Orange Peel.*—Sweet orange peel is only properly official in the United States Pharmacopœia, for, although mentioned in the Pharmacopœia of India, it is not ordered to be used in any preparation, bitter orange peel being preferred, as there stated. It has somewhat similar characters to bitter orange peel, but is far less bitter. (See *Citrus Bigaradia.*)

An essential oil is obtained in large quantities in the South of France and at Messina from both bitter and sweet Orange Peel, that from the first being preferred. These oils are distinguished as *Essence de Bigarade,* and *Essence de Portugal.* They are obtained by the *sponge,* or by the *ecuelle* process. (See *Oleum Limonis.*)

Medical Properties and Uses.—Sweet orange peel has aromatic stimulant properties, and is slightly tonic, but the tonic properties

are more marked in bitter orange peel; hence for medicinal purposes the latter is to be preferred. Sweet orange peel is principally employed for its agreeable flavour. It forms a grateful aromatic addition to some tonic and purgative medicines. In the case of children, colic, and even convulsions and death, have been caused from eating orange peel.

The oil of orange peel is largely consumed in Germany, in perfumery and liqueur-making.

3. Other Products of the Sweet Orange Tree.—The leaves and young shoots of the Sweet Orange, as well as those of the Bitter Orange, by distillation with water yield a volatile oil called *Essence de Petit Grain* or *Oil of Orange leaf*. This has been already referred to in treating of *Aqua Aurantii Floris*. The oil obtained from bitter orange leaves is of greater value from its superior fragrancy to that derived from sweet orange leaves. This essence was originally obtained from the small immature fruits termed *orange berries*. In odour it has some resemblance to Oil of Neroli, and, like it, is used in perfumery, and more especially in the preparation of Eau de Cologne. The small green immature fruits which drop from the trees of this as well as the bitter orange, are collected and dried, and form the *orange berries* of the pharmacies. Their size is about that of a cherry, their colour dark greyish-brown, and their odour aromatic and agreeable. They are used for flavouring Curaçoa and other substances; and the smaller ones, when smoothed by a lathe, constitute the ordinary *issue-peas* of pharmacists.

The ripe fruit is the Common, Sweet, or Portugal Orange, so highly valued as a dessert, and the juice of which is a valuable refrigerant, allaying thirst and preternatural heat in febrile and inflammatory complaints. Oranges are imported in chests and boxes, each orange being wrapped separately in paper. The best come from the Azores and Spain, and others from Portugal, Italy, the Canary Islands, and Malta. There are a great many varieties of the Sweet Orange, the more important being the Common or China orange, the Blood-red or Malta orange, and the St. Michael's Orange. Other varieties are sometimes imported,

as the Noble or Mandarin Orange, and the Tangerine Orange. So prolific is the orange tree that one plant will sometimes produce as many as 20,000 oranges.

Per. Mat. Med., vol. ii, p. 544; Pharmacographia, pp. 113 and 115; U. S. Disp., by W. & B., pp. 157 and 1039; Per. Mat. Med., by B. & R., p. 913.

DESCRIPTION OF PLATE.

Drawn from a specimen grown at Kew.

1. A branch with flowers and fruit.
2. Pistil with the petals and half the stamens removed.
3. Vertical section of ovary.
4. A petal.
5. Transverse section of fruit.
6. A seed.
7. Section of same showing the raphe.

(2 and 3 enlarged.)

D Blair FLS ad sicc. del. et lith.

M & N Hanhart imp.

CITRUS BERGAMIA, *Risso & Poit.*

N. Ord. Rutaceæ.
Tribe *Aurantieæ*.
Genus Citrus, *Linn.*

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52. Citrus Bergamia,* *Risso & Poiteau, Hist. Orang., p.* 111 (1818).

Bergamot.

Syn.—C. Aurantium, var. Bergamia, *W. & A.*
Figures.—Risso, Hist. Orangers, tt. 53—56.

Description.—A small tree, with numerous, irregular, ascending branches forming a lax head; twigs rather twisted, angular, smooth, without thorns, green. Leaves as in *C. Aurantium*, but usually smaller, entire; petioles narrowly winged. Flowers shortly stalked, considerably smaller than in the last, solitary or in shortly stalked clusters of 2 to 4 in the leaf-axils. Petals not more than ¾ inch long, spreading. Filaments of the stamens usually united at the base into bands. Pistil as in *C. Aurantium*. Fruit usually somewhat pyriform, often globose, not mamillar at the apex, usually about 2½ inches in diameter but not unfrequently larger, smooth, deep or pale lemon-yellow; pulp greenish.

Habitat.—The Bergamot has no claim to be considered a species, being merely one of the numerous cultivated races of the Orange or Lemon. From possessing somewhat intermediate characters between these it has been by some considered to be of hybrid origin, but its characters approximate more closely to the Orange, under which it is placed as a variety by Brandis and J. D. Hooker. It is known from the orange by its smaller flowers which have a very delicious and peculiar odour, and the form and paler colour of the fruit; in the latter characters there is, however, considerable variety, the Italian Bergamots being much

* *Bergamia*, from the Italian *Bergamotta*, so called from the resemblance of the fruit to the pear of the same name, which is said to be derived from the Italian town of Bergamo.

darker than those grown in the south of France which are greenish-yellow, and the shape being sometimes quite spherical.

The principal locality where the Bergamot orange is cultivated is near Reggio in Southern Calabria, but it is also grown in Sicily, Southern France, and elsewhere, though but rarely. It does not appear to have been known or distinguished before the end of the 17th century.

Risso, Hist. des Orangers, ed. 2, p. 82; Fl. Brit. India, i, p. 515; Flück. & Hanb., Pharmacogr., p. 108.

Official Parts and Names.—Limettæ Fructus Succus; the juice of the fruit of Citrus Bergamia (I. P.). Oleum Bergamii; the volatile oil obtained from the rind of the fruit of Citrus Limetta, *De Candolle* (U. S. P.). The juice of the fruit of this variety or species of Citrus under the name Citrus Limetta, *Risso,* is also recognised in the British Pharmacopœia, together with the juice of the fruit of Citrus Limonum, *D.C.,* for the preparation of Citric acid. Lime juice is also mentioned in the Pharmacopœia of India as one of the sources of Citric acid.

1. Limettæ Fructus Succus.—*General Characters, Composition, and Commerce.*—Lime juice has the same sharp acid taste as Lemon juice, which is described under *Citrus Limonum.* It has also essentially the same composition, but it is said to contain a larger percentage of citric acid. A large quantity of the so-called lemon juice of commerce is in reality derived from Lime fruits.

Our principal supplies of Lime juice are now obtained from the fruits of trees which grow wild in Jamaica, Tahiti, and elsewhere. Lime trees are also cultivated to a small extent in Jamaica, Dominica, &c.; and very largely of late years in the island of Monserrat, one of the Antilles, where 600 acres, containing more than 120,000 trees, are reserved for lime plantations. The juice is commonly imported in large casks, and after it has settled, it is clarified and bottled for use.

Medical Properties and Uses.—Its properties and uses are the same as those of Lemon juice; and are described under Citrus Limonum. By tropical practitioners it is often preferred to lemon juice; and in all cases as the *fresh juice* can be readily

obtained in nearly all parts of the tropics, the *preserved lemon juice* should not be substituted for it as it is less effectual.

Citric acid.—Citric acid of commerce is described in the British Pharmacopœia, and in the Pharmacopœia of India, as a crystalline acid prepared from lemon juice, or from the juice of the fruit of the lime; and a process for its preparation is given in the British Pharmacopœia. It exists in the juice of the lemon and lime in a free state. Its name is derived from its common occurrence in the genus Citrus, but it is also found in combination in a few other fruits, as the cranberry, tamarind, gooseberry, red currant, &c. The proportion of citric acid contained in lemon juice is stated under *Limonis Succus.*

Citric acid is in colourless crystals, of which the right rhombic prism is the primary form. It is very soluble in water, less soluble in rectified spirit, and insoluble in pure ether. The crystals dissolve in three fourths of their weight of cold, and in half their weight of boiling water. The diluted aqueous solution has an agreeable acid taste. When the solution is made by dissolving thirty-four grains of the acid in one ounce of water, it resembles lemon juice in strength and in the nature of its acid properties, and, like lemon juice, it undergoes decomposition and becomes mouldy by keeping. The aqueous solution is not darkened by sulphuretted hydrogen, gives no precipitate when added in excess to solution of acetate of potash, or of chloride of barium, and if sparingly added to cold lime water it does not render it turbid. The crystals leave no ash when burned with free excess of air. Seventy grains of the acid dissolved in distilled water are neutralised by 1000 grain measures of the volumetric solution of soda.

In its properties and uses citric acid closely resembles the juice of the fruits from which it is obtained, although according to Dr. Garrod, as mentioned by us in treating of Lemon juice, it is useless as a prophylactic and curative agent in scurvy, from the cause we have there explained.

2. Oleum Bergamii.—*Production.*—Oil or Essence of Bergamot is derived from *Citrus Bergamia,* var *vulgaris* of Risso, which is

D Blair F L S ad nat del et lith

M & N Hanhart imp

CITRUS MEDICA. *Risso*

N. Ord. RUSTACEÆ.
Tribe *Aurantieæ*.
Genus Citrus, *Linn.*

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53. Citrus medica,* *Risso, in Ann. du Muséum*, xx, *p.* 199 (1813).

Citron. Cedrat.

Figures.—Risso, Hist. Orangers, tt. 96—107; Nouveau Duhamel, vii, t. 22.

Description.—A small tree or shrub, about 10 feet high, without a distinct trunk and with irregular, straggling, short, thick branches; bark whitish-grey; young shoots stiff, purplish or violet-coloured. Leaves large, the petioles very short and not winged, blade 5—6 inches long, broadly oblong or oval-oblong, tapering at the base, obtuse at the apex, bluntly crenate-serrate, stiff but not thick, gland-dotted, dark green above, pale beneath, axillary spines large. Flowers generally unisexual, usually in clusters of several (3—10), pink, the buds purplish, otherwise much as in the Lemon. Fruit very large, more or less oblong in outline, often 8 or 9 inches long, usually blunt and not mammillate at the apex, the surface either smooth or more usually lobulated and rugged with both transverse and longitudinal furrows, pale or dark bright yellow; rind very thick and hard; pulp scanty, pale.

Habitat.—The Citron, like its congeners, is not known in a truly wild state, but its history and names point to a home in Asia, in Northern India or perhaps even further to the east. The westward spread of this species, however, commenced at an early period, and the fruit was well known to the Greeks and Romans, being the only *Citrus* mentioned by the classical writers. It was cultivated in Syria in the time of Josephus and was introduced into Italy probably in the third century, spreading westwards through the Mediterranean regions during the middle ages. At

* *Medica*; the fruits of the Citron were called *Mala medica* or *Mala persica* by the Romans from the country of their origin.

the present day it is not anywhere largely cultivated, the principal places in Europe being the neighbourhood of Florence, Sicily, Corsica and the Riviera; it is also grown in the Azores and Madeira, and in China, India, &c. It flowers and fruits irregularly all through the year.

There seems reason for believing with Rev. R. T. Lowe, that the Citron constitutes a good species. It is, however, closely allied to the Lemon, with which Linnæus united it, as does also J. D. Hooker and Brandis, who also place here the Sweet and Sour Limes, *C. acida*, Roxb., *C. Limetta*, Risso, and *C. Lumia*. Risso. It can be usually distinguished by its foliage. Innumerable varieties of the Citron fruit have been produced under cultivation, many of which have been figured in the treatises quoted above. The curious fingered Citrons of China and Japan (var. *chierocarpus*, Loureiro) are formed by a separation of the constituent carpels, a condition which occurs also sometimes in the Orange.

Hook. f., Fl. Brit. India, i, p. 514; Brandis, Forest Flora India, p. 52; Lowe, Man. Fl. Madeira, p. 71; Risso, Hist. des Orangers, ed. 2, p. 146; Grisebach, Fl. Brit. W. Indies, p. 132.

Part Used and Name.—Cortex Citri Medicæ; the peel. It is not official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United States. But formerly in the Edinburgh and Dublin Pharmacopœias the botanical source of Lemons was referred to *Citrus medica*, and in the Dublin Pharmacopœia we have therefore the names Cortex Citri Medicæ for Lemon Peel; Oleum Volatile Citri Medicæ for Oil of Lemons; and Succus Citri Medicæ for Lemon Juice. This species is figured in order to complete our illustrations of the plants of the genus Citrus, which yield, or have been supposed to yield, valuable medical and economic substances.

History and Cultivation.—The fruit of this plant is the Citron; or the *Cedrat* of the French. It is supposed to be the Hebrew Tappuach, which is translated in our version of the Old Testament as Apple tree and Apples. It is "the only member of

the Orange tribe the fruit of which was known in ancient Rome." Although formerly much cultivated by the Jews in Palestine, and subsequently in Italy and other parts of Southern Europe; at the present day the more prolific lemon tree has generally supplanted it, and it is now only found, as already noticed, on a small scale in cultivation.

General Characters and Composition.—The fruit is large, being sometimes as much as eight or nine inches in length, and weighing several pounds. It is covered by a thick hard rind or peel, the outer portion of which, termed the *flavedo,* is thin, of a yellow colour, and is filled with receptacles of volatile oil; the inner portion or *zest,* is white, thick, and spongy. The pulp is very scanty, and hence yields comparatively but a small quantity of juice; this is of an acid nature, resembling the lemon and lime.

Its constituents generally appear to be the same as the lemon and lime. A peculiar essential oil may, however, be obtained from the nearly ripe fruit by the sponge process, as described in our notice of *Citrus Limonum.* This has the same composition as Oil of Lemon, and is known as *Essence of Cedrat.* But as usually found in commerce, it is fictitious, being very rarely manufactured at the present day. This essence must be distinguished from the essence known as *Essence de Citron,* which is *Oil of Lemon.* The odour of Essence of Cedrat is a combination of the odours of citron and bergamot.

Properties and Uses.—The rind of the citron is imported into this country in a salted state; and is used when candied as a dessert, and in confectionery. The essence is employed in perfumery, and when really genuine, its odour is very agreeable; it is chiefly used in the preparation of perfumes for the handkerchief.

The juice of the fruit is less abundant than that of the lemon and lime, but it has similar properties. The leaves and flowers also yield by distillation fragrant oils; that of the latter is said to resemble oil of neroli.

Christison's Disp., p. 596; Per. Mat. Med., vol. ii, pt. 2, p. 533; Pharmacographia, p. 115; U. S. Disp., by W. & B., p. 526 Bentl., Man. Bot., p. 465.

DESCRIPTION OF PLATE.

Drawn from a specimen cultivated in Kew Gardens, the fruit added from a specimen in the Kew Museum from Venezuela.

1. A branch with male flowers.
2. Vertical section of flower; the petals removed.
3. A fruit.
4. Transverse section of the same.

(2 enlarged.)

D. Blair ad. viv. del. et lith.

M & N Hanhart imp.

CITRUS LIMONUM, *Risso*

N. Ord. Rutaceæ.
Tribe *Aurantieæ.*
Genus Citrus, *Linn.*

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54. Citrus Limonum,* *Risso,* l. c., p. 201 (1813).

Lemon.

Syn.—C. medica, var. β, *Linn.* C. acida, *Roxb.*

Figures.—Woodville, t. 89; Steph. & Ch., t. 92; Nees, t. 424; Hayne, xi, t. 27; Berg & Sch., t. 31 f; Risso, Oranges, tt. 70—95.

Description.—A straggling bush or small tree, 10—12 feet high, with numerous, irregular, short, angular branches, and sharp spines in the leaf-axils; bark clear grey, the younger branches green, the twigs reddish or purplish, glabrous. Leaves somewhat scantily produced, evergreen, alternate, blade 2—2½ inches long, ovate-oval, acute, rather yellow green, margin distinctly but distantly serrate, articulated with the petiole, which is about ½ an inch long and not, or very slightly, winged. Flowers solitary, rarely 2 or 3 together, in the axils, on longish peduncles, frequently unisexual. Calyx shallow, with 5 spreading teeth, persistent. Petals 5, less than ¾ of an inch long, oblong, spreading, white above, strongly tinged with purplish-pink externally. Stamens 20—40; filaments nearly as long as petals, separate, or more or less united into fours, hypogynous. Ovary supported on and surrounded at the base by a large, firm, rounded disk, about 10-celled, with several descending ovules in each as in the orange; style short, thick. Fruit, a rounded, ovoid, or obovoid berry, about 3 inches long, usually with a nipple-shaped extremity, bright yellow, smooth, with depressed punctations over the oil-glands; structure as in the orange; pulp acid, pale yellow. Seeds as in the orange, but smaller.

Habitat.—As a cultivated plant the lemon is now met with throughout the Mediterranean region, and in Spain, Portugal, the

* From the Arab *Limun* or *Limu,* which is said to have its origin in the Sanskrit *Nimbuka.*

Canaries, the Azores, and in all tropical and subtropical countries, but it appears that there is no certain notice of it in Europe before the latter part of the 15th century. The wild stock is native in the north-west provinces of India, ascending to 4000 feet in the mountains, where several forms are met with in a natural state. Under cultivation numerous races have been produced, of which Risso and Poiteau enumerate no less than 47, though they maintain as distinct the Sweet Limes (*C. Limetta*, Risso, with 8 varieties, and *C. Lumia*, Risso and Poit., with 12 varieties). These "sweet" Lemons differ, however, only in their fruit possessing an insipid instead of an acid juice. The Lemon is a more tender plant than the orange, but is frequently grown in our conservatories; it flowers and fruits nearly all the year round, and the scent of the flowers is very sweet, but quite distinct from that of orange blossoms.

Hook. f., Fl. India, i, p. 515; Brandis, Forest Fl., p. 51; Lowe, Fl. Madeira, i, p. 72; Lindl. Fl. Med., p. 164.

Official Parts and Names.—1. LIMONIS CORTEX; the outer part of the rind of the fresh fruit: 2. OLEUM LIMONIS; the oil expressed or distilled from fresh lemon peel: 3. LIMONIS SUCCUS; the freshly expressed juice of the ripe fruit (B. P.). 1. The outer part of the rind of the ripe fruit (*Limonis Cortex*): 2. The essential oil of the rind (*Limonis Oleum*): and, 3. The expressed juice of the ripe fruit (*Limonis Succus*) (I. P.). 1. LIMONIS CORTEX; the rind of the fruit: 2. OLEUM LIMONIS; the volatile oil obtained from the rind of the fruit: 3. LIMONIS SUCCUS; the juice of the fruit (U. S. P.).

Commerce and Varieties of the Lemon.—Lemons are imported into this country from southern Europe, principally from Sicily, but to some extent from Spain and other parts. The lemons are packed in chests, each lemon being rolled separately in paper. There are numerous varieties, the more important of which are the Wax Lemon, the Imperial Lemon, and the Gaeta Lemon.

1. LIMONIS CORTEX. *Lemon Peel.*—Lemon peel varies much in thickness, its inner portion is white, spongy, and without any

marked odour or taste; but its outer portion is pale yellow when fresh, (although deeper yellow when dried), and more or less rough on the surface in consequence of the abundance of receptacles of volatile oil which are imbedded in the tissue beneath. This outer portion, which was formerly called the *flavedo*, has a strong, peculiar, and fragrant odour; and a warm, aromatic, bitter taste. The fresh outer part of the rind is alone official in the British Pharmacopœia, and is very much to be preferred to dried lemon peel.

Lemon peel contains an abundance of essential oil, which will be presently described (see *Oleum Limonis*), and a bitter principle, of which but little is known, termed *hesperidin*. Some chemists have indicated the presence of a *bitter principle* and *hesperidin*, which they have regarded as a neutral crystalline tasteless substance.

Medical Properties and Uses.—Lemon peel is an aromatic stomachic, and is employed as an adjunct to stomachic infusions and tinctures, partly to increase their efficiency, but more especially as a flavouring agent.

The substance known as *candied lemon peel*, which is employed as a dessert and in confectionery, is also an agreeable stomachic. It is prepared by boiling lemon peel in syrup, and then exposing it to the air till the sugar crystallizes.

2. Oleum Limonis. *Oil of Lemon.—Production.* Oil or essence of lemon may be procured either by expression or distillation, that obtained by the first process being by far the more fragrant and valuable. Nearly all the oil of lemon which reaches this country is imported from Palermo and Messina, and is prepared in Sicily and Calabria. Some oil of lemon is also manufactured at Mentone and Nice in France. As obtained by distillation at Mentone and Nice the surface of fresh lemons is removed by rubbing on a coarse grater of tinned iron, and the grated peel then subjected to distillation with water; it is known as *Essence de Citron distillée*. The best essence of lemon is, however, known as *Essence de Citron au zeste*, and is prepared by scarifying the surface of the peel by rubbing the lemons over a number of sharp pins

placed upright upon a shallow basin of pewter, with the central portion prolonged downwards into a tube closed at its lower end. This vessel is called an *écuelle à piquer*.

The process by expression as now followed in Sicily and Calabria has been thus described by the authors of *Pharmacographia*: "The lemons are used while still rather green and unripe, as being richer in oil than when quite mature. Only the small and irregular fruit, such as is not worth exporting, is employed for affording the essence. The workman first cuts off the peel in three thick longitudinal slices, leaving the central pulp of a three-cornered shape with a little peel at either end. This central pulp he cuts transversely in the middle, throwing it on one side and the pieces of peel on the other. The latter are allowed to remain till the next day and are then treated thus:—the workman seated holds in the palm of his left hand a flattish piece of sponge, wrapping it round his forefinger. With the other he places on the sponge one of the slices of peel, the outer surface downwards, and then presses the zest-side (which is uppermost) so as to give it for the moment a convex instead of a concave form. The vesicles are thus ruptured, and the oil which issues from them is received in the sponge with which they are in contact. Four or five squeezes are all the workman gives to each slice of peel, which done he throws it aside. Though each bit of peel has attached to it a small portion of pulp, the workman continues to avoid pressing the latter. As the sponge gets saturated the workman wrings it forcibly, receiving its contents in a coarse earthen bowl provided with a spout; in this rude vessel, which is capable of holding at least three pints, the oil separates from the watery liquid which accompanies it, and is then decanted. The yield is stated to be vary variable, 400 pints affording 9 to 14 ounces of essence. The prisms of pulp and the exhausted pieces of peel are submitted to pressure in order to extract from them lemon juice, and are said to be also subjected to distillation. The foregoing is termed the *sponge process;* it is also applied to the orange. It appears rude and wasteful, but when honestly performed it yields an excellent product."

General Characters and Composition.—Oil of lemon as prepared, either by the *sponge* or *écuelle* process, is a limpid liquor, having a slight yellow colour, a very fragrant odour like that of the fruit, and a warm, bitterish, aromatic taste. Like the other oils obtained from the genus Citrus, it is dextrogyre. It dissolves but sparingly in rectified spirit, but readily in anhydrous alcohol. It mixes freely with bisulphide of carbon. The *distilled oil* is colourless, far less fragrant, and therefore less valuable as a perfume than the oil prepared as above, and is of less specific gravity. The purified oil of lemon resembles oil of turpentine in composition and general chemical characters. Oil of lemon, as found in commerce, is almost universally mixed with oil of turpentine, or with the cheaper distilled oil.

Medical Properties and Uses.—Oil of lemon is a stimulant and carminative when given internally, and stimulant and rubefacient when applied externally. It has been used as a local application in certain forms of ophthalmia, but with doubtful efficacy. It is chiefly employed in medicine to communicate an agreeable odour and flavour to other medicines. The chief use of oil of lemon is, however, in perfumery, and as a flavouring agent in confectionery.

3. Limonis Succus. *Lemon Juice.*—Concentrated lemon juice is imported in enormous quantities for citric acid manufacturers. As thus imported it is not derived from the lemon only, but also from the lime and bergamot.

General Characters and Composition.—The characters as given in the British Pharmacopœia are as follows:—"A slightly turbid yellowish liquor, possessing a sharp acid taste, and grateful odour. Average specific gravity 1·039. Average quantity of citric acid in one fluid ounce, 32·5 grains." According to Stoddart, however, the specific gravity averages 1·044, and an average of 42·53 grains of citric acid in an ounce of juice. The amount of acid, however, varies in different seasons, diminishing rapidly, as proved by Stoddart, with the advance of summer. Its principal constituents besides citric acid are *gum, sugar,* and, according to Cossa, *potash,* although Stoddart found only a minute proportion of this substance. Lemon juice readily undergoes decomposition,

and should not, therefore, be long kept for use, unless some precautions have been taken for preserving it.

A so-called lemon juice has been manufactured in this country by dissolving tartaric acid in water, then adding a little sulphuric acid, and flavouring with oil of lemon. Such a solution when used as an antiscorbutic, for which purpose it has been supplied, is valueless.

Medical Properties and Uses.—Lemon juice is refrigerant and antiscorbutic, and is exceedingly useful in forming agreeable and refreshing beverages, for allaying thirst, and in febrile and inflammatory complaints. These drinks may be given in the ferm of lemonade, or lemon juice may be added to barley-water. When lemon juice cannot be readily obtained, the best substitute for it is a solution made by dissolving about eight drachms of crystallised citric acid in sixteen ounces of water, and flavouring with a few drops of oil of lemon. Lemon juice may also be used in preparing effervescing diaphoretic and diuretic draughts, which are very valuable vehicles for the exhibition of other remedies and in other ways. The relative proportions required of lemon juice and citric acid, with the alkaline carbonates, for the formation of effervescing draughts, are as follows:

Lemon Juice or	*Citric Acid*	to 20 *grains* of
Fl. drs. iijss . .	grs. xiv .	Bicarbonate of Potash.
Fl. drs. vi . . .	grs. xxiv .	Carbonate of Ammonia.
Fl. drs. iv . . .	grs. xvii .	Bicarbonate of Soda.

Lemon juice is one of the best remedies we possess in scurvy, acting both as a prophylactic and curative agent. On this account, therefore, all ships destined for long voyages should be provided with concentrated lemon juice. But from the difficulty of preserving lemon juice, citric acid is usually substituted for it, although in Dr. Garrod's opinion it is useless, as, according to this author, the antiscorbutic power of lemon juice is due to the potash salts contained in it. Lemon juice is also given as a means of counteracting the effects of narcotic poisons, especially opium. Lemon juice has likewise been strongly recommended

by Dr. Owen Rees as a remedy in acute rheumatism, and has been highly spoken of by many practitioners in this disease, but, according to Garrod, there is "as yet no good clinical evidence proving its value in this disease. Many patients with acute rheumatism recover pretty rapidly when taking lemon juice, but many get well equally soon when taking coloured water."

Per. Mat. Med., by B. & R., pp. 908 and 909; Pharmacographia, pp. 103, 105, and 106; U. S. Disp., by W. & B., pp. 526 and 597; Per. Mat. Med., vol. ii, pt. ii, pp. 536 and 538; Stoddart, Ph. Jl., Oct., 1868, p. 203; Garr., Mat. Med., p. 218.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Royal Botanic Society's Gardens, Regent's Park, with the fruit added.

1. Pistil with the petals and most of the stamens removed.
2. Vertical section of ovary.
3. Transverse section of fruit.
4. Seed.
5. Section of same.

M&N Hannart imp.

ÆGLE MARMELOS *Correa.*

N. Ord. Rutaceæ.

Tribe *Aurantieæ*.

Genus Ægle,* *Correa*. B. & H., Gen., i, p. 306; Baill., Hist. Pl., iv, p. 488. Species 2, natives of tropical Asia.

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55. Ægle Marmelos,† *Correa in Trans. Linn. Soc. Lond.*, v, *p.* 223 (1800).

Bael. Bel. Bili. Bilva. Mahura.

Syn.—Cratæva Marmelos, *Linn.* C. religiosa, *Ainslie.*

Figures.—Rheede, Hort. Malab., iii, t. 35; Rumph., Herb. Amboin., i, t. 81; Roxb., Coromandel Pl., ii, t. 143; Wight, Ic. Pl. Ind., t. 16; Beddome, Fl. Sylv., t. 161.

Description.—A tree reaching a height of 30 or 40 feet when cultivated, with a short thick trunk and narrow oval head; in the wild state smaller and more irregular, with short, strong, sharp, spiny branches 1 inch or more in length in the axils of the leaves; bark bluish-grey, soft, with irregular furrows on the younger branches. Leaves alternate, compound, with one (rarely 2) pairs of shortly stalked opposite leaflets, and a larger long-petioled terminal one, leaflets 1—2 inches long, ovate or oval-ovate, abrupt or tapering at the base, somewhat attenuated towards the blunt apex, very shallowly serrato-crenate, smooth, thin, midrib prominent beneath. Flowers ¾ inch wide, sweet-scented, stalked, solitary or in few-flowered, lax, erect, axillary or terminal cymes. Calyx shallow, with 5 short, broad teeth, pubescent outside. Petals 5 (rarely 4), oblong-oval, blunt, thick, pale greenish-white, dotted with glands, imbricate, spreading. Stamens numerous, sometimes coherent in bundles, hypogynous, with short filaments half as long as the linear anthers. Disk none or very small. Ovary oblong-ovoid, slightly tapering into the thick short style which is again somewhat thickened upward, stigma capitate, axis of ovary wide,

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* *Ægle*, the name of one of the Hesperides, whose orchards bore golden fruit.

† *Marmelo* is Portuguese for Quince, and the fruit was called "Marmelos de Benguala" (Bengal Quince) by the mediæval writers.

cells numerous, 8—20, small, arranged in a circle, with numerous ovules in each cell. Fruit usually globose, 2—5 inches in diameter, pericarp nearly smooth, greyish-yellow, about $\frac{1}{8}$ inch thick, hard, filled with softer tissue becoming very hard and orange-red when dry; cells as in ovary. Seeds very numerous, somewhat compressed, ranged in closely packed tiers in the cells, and surrounded by a very tenacious, slimy, transparent mucus which becomes hard when dry; testa white, covered with woolly hairs immersed in the mucus, embryo with large cotyledons, and a short superior radicle; no endosperm.

Habitat.—The Bael tree grows throughout the Indian Peninsula in dry hilly places, reaching in the Western Himalaya to the altitude of 4000 feet. It is extensively cultivated and frequently planted near the Hindoo temples. It is also found either wild or cultivated in Java, Burma, and some other Eastern Asiatic localities.

The pretty sweet-scented flowers appear about May with the young leaves, and the fruit is ripe in October and November, remaining long on the tree. The cultivated Bael is often without the axillary spines. There is some variety in the size and form of the characteristic fruit which is found sometimes ovoid, pyriform or oblong, instead of the ordinary globular shape. The tree does not flower in our botanic gardens.

Hook. f., Fl. Brit. Ind., i, p. 516; Brandis, Forest Fl., p. 57; Lindl., Fl. Med., p. 162.

Official Part and Name.—Belæ Fructus; the dried half-ripe fruit (B. P.). The half-ripe fruit (*Belæ Fructus, Bael*) (I. P.). It is not official in the United States Pharmacopœia.

Collection and Commerce.—For medicinal use the fruit should be collected in a half-ripe state, and carefully dried, for if allowed to ripen, it entirely loses its astringent properties, and becomes a mild aperient. It is imported from Malabar and Coromandel.

General Characters and Composition.—Bael fruit, or as it is commonly called Indian Bael, is of a roundish form, about the

size of a large orange, and is covered with a hard woody rind. It is rarely imported entire, but is usually found in commerce in dried slices, or in fragments consisting of portions of the hard woody rind and adherent dried pulp and seeds. The rind is about 1½ lines thick, and is covered with a smooth, firmly adherent, pale brown or greyish epicarp, and, internally, as well as the dried pulp, has a brownish-orange or cherry-red colour. This colour of the pulp is, however, only superficial, for when broken it is seen to be colourless. It has no marked odour; but the taste of the pulp is mucilaginous and feebly acid, without any astringency, sweetness, or aroma.

According to the analyses of Professor Macnamara and Mr Pollock, bael fruit contains *tannic acid*, a *concrete volatile oil*, a *bitter principle*, and a *balsamic principle*, resembling in odour Balsam of Peru. But as an infusion of bael exhibits no perceptible change when acted upon by a per- or proto-salt of iron, the amount of tannic acid which it contains must be very small indeed; and Flückiger and Hanbury, speaking in reference to the above analyses, say that they are not able to give any confirmation to them, nor to "explain by any chemical examination upon what constituent the alleged medical efficacy of bael depends." According to them, the pulp when moistened with cold water yields a red liquid chiefly containing *mucilage*, and probably *pectin*.

Substitutions.—In this country the substitution of the dried rind of the Mangosteen fruit (*Garcinia Mangostana*), for Bael Fruit has been noticed by one of us, and described in the 'Pharmaceutical Journal.' Mangosteen rind may be readily distinguished from Bael fruit by its darker colour, greater thickness, absence of adhering pulp, easily separable epicarp, and by some of the pieces having upon them dark-coloured radiating wedge-shaped projecting processes (*stigmas*).

The fruit of *Feronia Elephantum*, Correa, which is commonly known under the name of Wood Apple, is also sometimes substituted for Bael fruit; as is also Pomegranate Peel, which will be hereafter described under the head of Punica Granatum. The

characters of both these fruits are, however, so different from those of Bael fruit that they cannot well be mistaken for it.

Medical Properties and Uses.—Bael fruit is said to possess astringent properties, and in India it is regarded as a valuable and efficacious remedy in diarrhœa, dysentery, habitual constipation, and irregularity of the bowels. As tried, however, in this country, it does not appear to be superior, or even equal in value, to some of the other official vegetable astringents in common use. Some of the difference observable in the remedial effects of Bael fruit as used in this country and in India is doubtless due to the fact of the dried fruit being here used, whilst in India it is employed in a fresh state.

Other Products of the Bael Tree.—The ripe fruit, which is known in India as the Bengal Quince, is said to have a very agreeable odour and taste. It is described as a mild aperient, and the juicy pulp when mixed with water and sweetened, is employed as a refrigerant drink in fevers and inflammatory affections attended with thirst. A preserve and a jelly are also prepared from the ripe fruit with sugar, and are said to be beneficial in habitual costiveness.

The bark of the root and stem, the flowers, and the expressed juice of the leaves, are also employed medicinally by the natives of India; but they do not appear to possess any very marked properties.

Per. Mat. Med., vol. ii, pt. 2, p. 549; Per. Mat. Med., by B. & R., p. 918; Pharmacographia, p. 116; U. S. Disp., by W. & B., p. 168; Pharmacopœia of India, p. 46; Pharm. Journ., vol. x, 1st ser., p. 165; Indian Ann. of Med. Sci., vol. ii, p. 233; Pollock, in Lancet, July, 1853, and Martin, in Lancet, 1853, vol. ii, p. 53; Bentley, in Pharm. Journ, vol. viii, 2nd ser., p. 654.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected by Horsfield in Java. 1. A flowering branch. 2. A stamen. 3. Calyx and pistil. 4. Section of the same. 5. Section of ovary. 6. Transverse section of half-ripe fruit. 7. Ripe fruit. 8. Seed. 9. Section of the same. (2–5 enlarged.)

T Blair FLS ad nat del. et lith.

M&N Hanhart imp

SIMAROUBA AMARA, *Aublet.*

N. Ord. Simarubaceæ. Lindl., Veg. Kingd., p. 476; Le Maout & Dec., p. 326; Baill., Hist. Pl., iv (under *Rutaceæ*).

Tribe *Simarubeæ*.

Genus Simarouba,* *Aublet.* B. & H., Gen., i, p. 309; Baill., Hist. Pl., iv, p. 490. Three or four species, natives of eastern tropical America, are known.

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56. Simarouba amara, *Aublet, Hist. Pl. Guiane,* ii, *p.* 860 (1775) (non *Hayne*).

Sumaruppa (Guiana). *Marubá* (Brazil).

Syn.—Quassia Simaruba, *Linn. f.* (non *Wright*). Simaruba officinalis, *DC.*

Figures.—Aublet, Hist. Pl. Guiane, tt. 331, 332; Nees, t. 382.

Description. — A tree of 60 feet or more in height, with numerous long, somewhat crooked branches covered with a smooth greyish bark, the young twigs very minutely puberulous. Leaves alternate, 9—12 inches long, on a longish, smooth, cylindrical petiole, somewhat dilated at the base, without stipules, unequally or abruptly pinnate with 3—5 pairs of alternate or subopposite leaflets; leaflets 2½—4 inches long, very shortly stalked, oval-oblong, tapering at the base, rounded at the apex, but with sometimes an acuminate apiculus, quite entire, glabrous, thick, paler beneath, with the midrib prominent to the apex. Flowers small, unisexual, dicœcious (? sometimes moncœcious), very shortly stalked, collected into small few-flowered subglobose clusters (cymes) on the slender elongated divaricate branches of large, lax, spreading terminal or axillary panicles, bracts small, leaflike, spathulate, deciduous. Male flowers :—Calyx small, shallow, cup-shaped, thick, with 5 slight, broadly triangular, acute teeth; petals much longer than the calyx, imbricate in the bud, oblong-oval, blunt, rather thick, somewhat concave, dull white; stamens 10, in one row, shorter than the petals, hypogynous, anthers large, broadly

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* *Simarouba*, the Carib name. The founder of the genus spells it thus, but subsequent writers have usually written *Simaruba*.

oblong, dorsifixed, dehiscing laterally, filaments purple, smooth, provided at the base on the inside with an erect rounded scale about half its length, covered on the outside and margins with long whitish hairs; pistil undeveloped in the form of an obscurely 5-lobed central body. Female flowers:—Calyx and petals as in the male; stamens rudimentary, scale-like, narrowed at the base, blunt at the apex, with long hairs on the outer side; pistil elevated on a disk, ovaries very deeply divided into 5 nearly separate, oblong-ovoid carpels, each with a solitary ovule, styles as long as the ovaries, united into one, stigma thick, broad, radiately 5-lobed. Fruit of 5 (or less by abortion) sessile, spreading drupes, oblong-ovoid, about $\frac{2}{5}$ inch long, slightly keeled from the base to the apex, smooth, nearly black. Seed solitary, with a membranous testa, cotyledons thick, fleshy, radicle very short; no endosperm.

Habitat. — This tree inhabits Northern Brazil and Guiana, growing pretty frequently on hill sides, in damp sandy ground, but does not extend into Central America, though it occurs in the islands of Dominica and St. Vincent. In the West Indies generally its place is taken by the closely allied species *S. glauca*, DC. This latter has been often confounded with *S. amara*, Aublet, but differs in its smaller and narrower leaflets, linear anthers, and much larger drupes, which are more compressed and keeled on the ventral surface. This tree is the Stavewood or Mountain Damson of Jamaica, where it is common. It was described by Wright in 1778 under the name of *Q. Simaruba*, in Trans. Royal Soc. Edinb., ii, p. 73, with 2 plates of the male and female plants respectively, of which the male is copied in Woodville, t. 203; the female in Hayne, ix, t. 15 (*S. amara*) and Steph. and Ch., t. 171. Berg and Schmidt, t. 13 f, also figure it under the name of *S. medicinalis*, Endl. Besides Jamaica, this species occurs in Cuba abundantly, in Florida, Panama, Yucatan, and other parts of Central America.

S. amara flowers in November and December, and the fruit is ripe in March and April. Aublet describes the male and female flowers as growing mingled in the same panicles, but Engler

states that he has never seen monœcious specimens, and the other species of the genus are constantly dicœcious.

Aublet, Hist. Pl. Guiane, ii, p. 860; Grisebach, Fl. Br. W. Indies, p. 139; Engler, Fl. Brasil., fasc. 65, p. 223; Lindl., Fl. Med., p. 207.

Official Part and Name.—SIMARUBA; the bark of the root of Simaruba officinalis, *De Cand.* (U. S. P. *Secondary*). It is not official in the British Pharmacopœia or the Pharmacopœia of India; but it was formerly recognised in both the Edinburgh and Dublin Pharmacopœias.

Collection and Commerce.—The bark of the root is alone collected for medicinal use, the wood itself being almost inert. It is imported packed in bales, and is usually obtained direct from Jamaica.

General Characters and Composition.—Simaruba root-bark, or Simaruba as it is officially designated, is found commonly in pieces several feet long, which are either folded lengthwise or more or less quilled; and varying from one to two three or more inches in breadth or diameter. In some cases the bark is found in flattened pieces a few inches only in length; these are transversely-cut portions of the longer specimens. Simaruba is somewhat rough externally, warty, and marked with transverse ridges. It is light in weight, and very fibrous, so that it is extremely tough and difficult to powder. Its surface has a greyish, greyish-brown, or whitish-yellow colour; beneath, the bark is darker, and yellowish brown; and on the inside it is pale yellowish-white after keeping, but distinctly yellow when fresh. It is without odour, but with a purely bitter, not unpleasant taste.

The bitter taste and medical properties of simaruba bark appear to be due essentially to the same principle which is contained in Quassia wood, and which is alluded to in our notice of *Picræna excelsa*, under the name of *quassin*. Simaruba also contains some *resin*, *volatile oil*, and other unimportant ingredients. Its properties are readily extracted both by water and spirit.

Medical Properties and Uses.—Simaruba possesses tonic pro-

perties and may be used in the same cases as the other pure bitter tonics; but in large doses it is apt to cause vomiting and purging, and also in some cases diaphoresis and diuresis. It has been principally employed in dysentery, whence it has been called *dysentery bark*. It should only be used, however, in the latter stages of acute dysentery, after the fever has abated, and when the tenesmus continues with a weak and sinking state of the pulse. When employed at this stage it allays the latter symptom as well as griping, promotes the secretion of urine, determines to the surface, and restores the tone of the intestines. It has also been used in diarrhœa; and like other vegetable tonics in various diseases in which such remedies are indicated. At the present day it is, however, but rarely employed in this country or in the United States.

Steph. & Church., Med. Bot., by Burnett, vol. iii, pl. 171; Per. Mat. Med., vol. ii, pt. 2, p. 390; Per. Mat. Med., by B. & R., p. 883; U. S. Disp., by W. & B., p. 808; Thomson's Lond. Disp., by Garrod, p. 644; O'Brien, in Trans. of the King and Queen's Coll. of Phys. in Ireland, vol. i, p. 237; Wright, in Trans. Roy. Soc. of Edinb., vol. ii, pt. 2, p. 73.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected at Santarem, Brazil, by Spruce; the fruit added from Aublet and (*S. glauca*) Berg.

1. Portion of the panicle of a male tree.
2. A leaf.
3. A male flower.
4. Section of the same.
5. Stamens.
6. Fruit.
7. A single drupe.

(3–7 enlarged.)

D.Blair ad nat. del. et lith.

M&N Hanhart imp.

PICRÆNA EXCELSA, *Lindl.*

N. Ord. SIMARUBACEÆ.

Tribe *Simarubeæ*.

Genus Picræna,* *Lindl.* B. & H., Gen., i, p. 311; Baill., Hist. Pl., iv, p. 494. Species 3, natives of tropical America.

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57. Picræna excelsa, *Lindley, Fl. Medica, p.* 208 (1838).

Jamaica Quassia. Bitter Wood. Bitter Ash.

Syn.—Quassia excelsa, *Swartz.* Q. polygama, *Lindsay.* Simaruba excelsa, *DC.* Picrasma excelsa, *Planchon.*

Figures.—Trans. Royal Soc. Edinburgh, iii, t. 6, cop. in Hayne, ix, t. 16, and Woodville, vol. v; Nees, t. 381; Steph. & Ch., t. 173 (from a specimen in Linnæus' herbarium); Baill., iv, fig. 472.

Description.—A tree, 50—60 feet high, with a straight, thick, erect trunk and spreading branches, bark rather smooth, brownish-grey, wrinkled; the extremities with a short rufous down. Leaves alternate, with small deciduous stipules, pinnate with 4 or 5 pairs of leaflets and a terminal one, covered with fine, fulvous down when young; leaflets equal, shortly stalked, 2—4 inches long, ovate- or oval-oblong, acute at the apex, somewhat tapering and usually unequal at the base, entire, leathery, glabrous, paler and with prominent veins below. Flowers small, stalked, polygamous (bisexual and male), arranged in dense, much branched, corymbose-paniculate cymes, which are often extra-axillary, not so long as the leaves. Bisexual flowers: calyx flat, with 5 distant, very small, ovate, acute, persistent teeth. Petals 5, alternate with the calyx-teeth, ovate-oblong, about $\frac{1}{12}$ inch long, pale yellowish-green, valvate in bud. Stamens 5, alternating with the petals, inserted at the lower part of the large hypogynous disk, about as long as the petals, filaments tapering, hairy on the inside, anthers subglobose, yellow. Carpels usually 3 (sometimes 2), elevated on a large, thick, rounded disk or gynophore, ovaries 1-celled, slightly united, globular, quite smooth, styles united in the lower half, separate above, forming 3 (or 2) simple, spreading branches, much

* Name from πικρός, bitter.

exceeding the stamens. Male flowers: petals more delicate, oval-lanceolate and spreading, stamens longer than the petals, no trace of carpels or gynophore, otherwise as the bisexual flowers. Fruit consisting of 1—3, often 2, separate, black, shining, nearly spherical drupes about the size of a large pea, supported on the hardened, stalk-like gynophore, and with a short point on the inner side marking the position of the style; pulp scanty, endocarp crustaceous, thin, yellow, thicker at the inner side. Seed solitary, attached by a broad hilum to the base of the inner side of the drupe, which it completely fills, testa thin, marked with ramifying vessels, embryo homogeneous, soft and fleshy, undivided, with a small radicle; no endosperm.

Habitat.—This large tree is common in the Island of Jamaica, and is also found in some other West Indian Islands, as St. Kitts, Antigua, and St. Vincent. Its foliage and habit are not unlike those of the common Ash, whence one of its colonial names. The flowers appear in October and November, and the fruit is ripe in December and January. Small trees are grown in the stoves of botanic gardens, but the plant has not yet flowered, at least at Kew.

Lindsay, in Trans. Royal Soc. Edinburgh, 1794, p. 205; Swartz, Fl. Ind. occid., ii, p. 742; Grisebach, Fl. Brit. W. Indies, p. 140; Lindl., Fl. Med., p. 208.

Official Part and Names.—Quassiæ Lignum; the wood (B. P.). The wood (*Quassiæ Lignum*) (I. P.). Quassia; the wood (U. S. P.).

Commerce.—Quassia wood is exported from Jamaica, the amount in 1873 being about 60 tons.

General Characters and Composition.—Quassia wood, or as it is also called Bitter wood (or sometimes Jamaica Quassia wood, to distinguish it from the original quassia wood, which is the produce of *Quassia amara*, L., a native of Surinam, and therefore known as Surinam Quassia wood, and which is described below under the heading of Adulterations and Substitutions), is imported in billets or logs of varying size, but often as thick as a man's thigh, and several feet in length. These billets, which are

obtained from the trunk and larger branches, are covered by a smoothish bark, which has a dark grey colour externally, and is white and fibrous internally. In the quassia of commerce this bark is commonly removed, and the wood, which is tough, and of a very pale yellowish-white colour, alone employed in medicine. As found in the shops it is in the form of chips or raspings. Quassia wood has no odour, but an intense and pure bitter taste.

The bitter taste and medical properties of Quassia wood are especially due to the presence of a neutral crystallisable principle, termed *quassin* or *quassite*, which exists in it in the proportion of about $\frac{1}{10}$ per cent. Quassin is soluble in dilute alcohol, in chloroform, and in about 200 parts of water, but is insoluble in ether. Quassia wood contains no tannic acid or other astringent matters.

Adulterations and Substitutions.—The chips of other woods have been sometimes substituted for, or used as adulterants of, those of quassia. The intense and pure bitterness of the genuine drug will generally distinguish it. The infusions of other woods are also commonly changed to black or blueish-black by a persalt of iron, in consequence of the presence in them of tannic acid; but as quassia chips contain no astringent acid, no such effect is produced under like circumstances on their infusion.

Besides the official Quassia wood of the British, Indian, and United States Pharmacopœias, there is another kind of Quassia which is used in France and Germany, and, indeed, the German Pharmacopœia of 1872 forbids the use of any other quassia. This quassia is the one already alluded to as derived from *Quassia amara*, L., and termed Surinam quassia from its geographical source. This kind was the original quassia of the Materia Medica, and the one upon which the reputation of quassia as a medicine was established; but as the tree yielding it was of small size, the demand for it soon exceeded the supply, and the present official quassia became entirely substituted for it in this country and the United States of America. It is in cylindrical pieces, covered by a thin, easily separable, greyish-white bark. It has no perceptible odour, but a pure bitter taste; and in its chemical and medical properties it closely resembles the Jamaica or official quassia wood.

Medical Properties and Uses.—Quassia wood is a pure bitter tonic and stomachic. It also possesses anthelmintic properties, and is supposed by some to be narcotic, as it acts as a narcotic poison on flies, and also, it is said, on some of the higher animals. In overdoses it causes vomiting. It is a valuable remedy in atonic dyspepsia, in debility, and in convalescence after acute diseases. It has also been administered with success as an antiperiodic in fevers; and as an enema to destroy thread-worms in children. As it contains no tannic acid, it is frequently given in combination with chalybeates.

The *bitter-cups* now frequently sold, are manufactured from quassia wood.

Like other pure bitters, its infusion may be used to preserve animal matters from decay. The *Papier mouri*, which is largely used to destroy flies, is prepared from an infusion of quassia sweetened with sugar. Quassia is also very extensively employed by brewers, &c., as a substitute for hops in the manufacture of beer and ale.

Per. Mat. Med., vol. ii, pt. 2, p. 392; Christison's Disp., p. 763 Pharmacographia, p. 118; Waring's Therapeutics, 2nd edit., p. 602; U. S. Disp., by W. & B., p. 720; Liebig's Annalen d. Pharm., vol. xxi (1837), p. 40; Parrish, in Amer. Journ. of Pharm., vol. xxix, p. 104; Whipple, in Pharm. Journ., vol. xiii, 1st ser., p. 642.

DESCRIPTION OF PLATE.

Drawn from specimens in the British Museum collected in Jamaica (Dr Wright) and St. Kitts (Masson).

1. A branch with bisexual flowers.
2. A hermaphrodite flower.
3. The same with the petals removed.
4. Section of the same.
5. A stamen.
6. Fruit.
7. A single drupe seen from the inner side.
8. Vertical section of the same.
9. A male flower.
10. A stamen from the same.

(2-5 and 8-10 enlarged.)

D.Blair F.L.S ad nat del et lith.

M&N Hanhart imp.

BOSWELLIA CARTERII, *Birdwood.*

N. Ord. Burseraceæ. Lind. Veg. Kingd., p. 459 (*Amyridaceæ*); Le Maout & Dec., p. 331; Baill., Hist. Pl. v. (*Terebinthaceæ*).

Tribe *Bursereæ*.

Genus Boswellia,* *Roxb.* B. & H., Gen., i, p. 322; Baill., Hist. Pl., v, p. 312. About 6 or 7 species are known, natives of Eastern Tropical Africa, Arabia Felix, and India.

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58. Boswellia Carterii,† *Birdwood, in Trans. Linn. Soc. Lond.*, xxvii, *p.* 143 (1871).

Mohr Madow; Mohr Meddu (Somali) *Maghrayt d'Sheehaz* (S. Arabia). *Frankincense* or *Luban Tree.*

Syn.—B. thurifera?, *Carter*, non *Colebrook.* B. sacra, *Flückiger* (ex Hanb.). B. Bhau-Dajiana, *Birdw.* ?

Figures.—Journ. Bombay Branch of R. Asiatic Soc., ii, t. 23; Trans. Linn. Soc. Lond., xxvii, tt. 29, 30, & (*B. Bhau-Dajiana*) t. 31.

Description. — A small tree, usually 12—14 feet in height, rarely reaching 20 feet, of elegant habit. Stem rather stout, branched, younger branches cylindrical, growing chiefly by the terminal buds and therefore scarcely tapering and with few twigs, about ½ inch in diameter; bark smooth, pale brownish yellow, splitting into thin, waxy-looking, papery sheaths which loosely surround the branch and are successively thrown off in large flakes and renewed from beneath, the summit below the new growth of the year surrounded by a thick ring formed of the bases of the petioles of the previous year agglutinated by the exuded gum-resin; the shoots of the year stout, slightly angled, densely covered with short yellow hairs. Leaves alternate, without stipules, either closely packed so as to form a terminal tuft, or distantly placed on the shoots with developed internodes, widely spreading, stalked, imparipinnate, 6—10 inches long; leaflets opposite in 7—10 pairs and a terminal one, sessile, unequal, the

* *Boswellia*, in commemoration of Dr. John Boswell of Edinburgh.

† *Carterii*, after Assistant-Surgeon H. J. Carter of the Indian Army, who collected the plant in 1844 and first accurately described it in 1847.

lower ones the smallest, usually about 1½—2 inches long, but the terminal one sometimes 3 inches, ovate-oblong, variable in width, rounded or subcordate and often unequal at the base, obtuse at the apex, usually somewhat wavy, irregularly crenate-serrate or crenate, glabrous (except on the midrib) or covered with a short pubescence above, paler and densely pubescent beneath; rachis stout, stiff, flat above, densely covered with short hairs. Flowers stalked, rather small, laxly arranged on the elongated spreading or divaricate branches of erect panicles coming off from the axils of the leaves and not equalling them in length, bracts ovate-acuminate exceeding the buds, woolly-ciliate, soon falling. Calyx cup-shaped, the "tube" solid, obconical, segments 5, narrow triangular, bluntish, thin, faintly ciliate on the margin. Petals 5, alternating with the sepals and twice as long, ovate, acute, slightly hooded at the apex, widely spreading, glabrous, finely veiny, white or cream-coloured, imbricate. Stamens 10, inserted outside and below the hypogynous disk (or upon its outer surface), erect, filaments short, a little longer than the disk, cylindrical, tapering, anthers dorsifixed near the lower end, oblong, 2-celled, orange. Disk very large, thick and prominent, forming a circular cup, with 5 or 10 crenate pubescent lobes alternating with the stamens, rose-coloured. Ovary sessile on the receptacle inclosed by but free from the disk, ovoid, 3-lobed, smooth, 3- or 4-celled with 2 pendulous ovules in each cell, style thick, a little exceeding stamens, stigma capitate, faintly 3-lobed. Fruit small, ¼—½ inch long, pear-shaped, triangular on a cross section, supported at the truncate base by the persistent receptacle, disk and stamens, 3- or 4-celled, pericarp smooth, fleshy, rather thick, dehiscing septifragally into 3 or 4 valves which entirely fall away from the large persistent axis and dissepiments, which latter remain as thin projecting wings; pyrenes one in each cell attached to the upper part of the axis, trigonous, pointed at each end, the back rounded, thin, leathery, rather rough, the sides smooth, the inner angle sharp. Seed (not seen) solitary in the pyrene, attached to its inner angle, embryo somewhat curved in the axis of the endosperm, cotyledons foliaceous, trifid, radicle superior.

In the only fruit we have had an opportunity of examining the seeds had become abortive; the above description is, therefore, taken from Endlicher's figures of *B. papyrifera* in his 'Iconogr. Gen. Plant.,' tt. 119, 120.

Habitat.—This, the true Frankincense or Luban tree, inhabits, so far as at present known, two limited districts of a very similar character and intensely hot climate, in tropical Arabia and Eastern tropical Africa, and has been seen alive in its native localities by very few European travellers. Although olibanum has been highly prized and well known from the earliest periods of history, it is only comparatively recently that any definite information about the trees producing it has been obtained, mainly by the investigations of Mr. Carter and Dr. Birdwood. The former collected specimens of the tree in the year 1844 and 1846, near Merbat and the promontory Ras Fartak on the Hadramaut coast of south-east Arabia, and he states that it is almost exclusively between these two points, *i.e.* between 52° 47′ and 55° 23′ E. long., that the plant occurs. The country is fertile, hilly and wooded; at two days' journey from the coast there is a range of limestone mountains reaching in the highest part to 5000 feet, and upon the summits and steep escarpments of this range the trees are abundant, usually growing out of the crevices of the rocks; they also occur close to the coast on the detritus of the limestone cliffs. This is the country clearly indicated by all the writers of antiquity as the libanophorous region and once occupied by the Sabæans. West of Ras Fartak the Frankincense tree becomes rarer, and between Makalla and Aden it is not known to grow: at Aden itself near the tanks are some trees planted by Col. Playfair. A tree from Arabia brought by Carter is still growing in the Victoria gardens at Bombay.

In Somali-land the tree grows in abundance on the range of limestone hills which, commencing near Berberah, extends eastwards in an unbroken chain parallel to and near the coast to the well-known promontory Ras Asser (Cape Guardafui); here it seems to occur in quite similar situations to the Arabian localities, rooted in the clefts of the limestone rocks on the mountain slopes;

according to Hildebrandt it is restricted to the higher region, 1000—1800 mètres. The flowers arè produced in April.

Of the published figures, the original one of Carter was drawn directly from wild Arabian specimens, and Birdwood's tab. 30 from the tree planted in Bombay, whilst tab. 29 of Birdwood's memoir represents a Somali-land plant sent by Col. Playfair to Bombay. The latter appears to be a larger tree than the Arabian one.

Among the scanty specimens at present available some marked differences of foliage are clearly noticeable. In the plant we have figured the leaflets are narrow and nearly glabrous above, but pubescent on the under surface and somewhat paler. In another form, sent to Kew from Bunder Murayah on the Somali coast by Playfair (*Boswellia* no. 4 of the "Flora of Tropical Africa"), the leaves are also smooth above, but very white beneath, with a minute dense, mealy pubescence, whence, perhaps, the plant gets the name of "Mohr-Add," which, according to Playfair, it bears, the word "add" meaning white, whilst "meddu" or "madow" signifies black. The "Mohr-Add" of Birdwood, however, is described by him as a separate species, *B. Bhau-Dajiana* (after Dr. Bhau-Daji, a distinguished Hindoo physician of Bombay), and may or may not include the plant of Playfair just mentioned. *B. Bhau-Dajiana* is also from Somali-land, and has small, flat, narrow-oblong leaflets strongly pubescent on both surfaces. A plant of this sent to Bombay flowered in 1868 and is figured in Dr. Birdwood's memoir, t. 31. Another form, which seems more strongly marked, is the *Boswellia* no. 6 of the "Flora of Tropical Africa" in which the leaflets are ovate, rounded or cordate at the base, much crispo-crenate on the margin, densely and softly pubescent on both surfaces and rugose beneath. Of this we have seen only leaves.

Until more material is available for comparison, it is not possible to decide whether these or any of them should be regarded as specifically distinct from *B. Carterii*, but it seems most probable that they are mere varieties, as the foliage even on a single tree is known to vary considerably. The trees grown, evidently in an unsuitable climate, at Bombay have rather tended to confuse than clear up this point.

The whole tree abounds in the fragrant gum-resin, which exudes as a milky juice from the leaves and flowers as well as the stem when wounded. The main quantity is, however, found in the cortical layers of the stem. The structure of these in *B. neglecta*, another species from Somali-land, has been lately described by Mr. S. Moore, and figured in the 'Journal of Botany' for 1877, p. 68, t. 158; but we have not met with any similar microscopic examination of the stem of the present species. During the flowering season the delightful fragrance of the Luban trees is wonderfully powerful, and extends so far that the air is redolent of it even at some distance from the coast, as has been familiar to navigators for centuries.

All the species of *Boswellia* produce analogous products. *B. thurifera*, Colebr. (*B. serrata* and *B. glabra*, Roxb.), is the Salai tree of India, where its resin is largely used for incense; *B. papyrifera*, Rich. (*Plosslea floribunda*, Endl.), a native of Abyssinia and Nubia, has an abundant excretion which, however, is not collected, and *B. Frereana*, Birdw., the Yegaar tree of the Somalis, affords Luban Maitee or Meyeti, a very fragrant true resin chiefly employed in the East as a masticatory.

Carter, in Journ. Bombay Branch of R. Asiatic Soc., ii (1847), p. 380; Oliver, Fl. Trop. Africa, i, p. 324 (Boswellia, nos. 4, 5, & 6); Birdwood, in Trans. Linn. Soc., xxvii, p. 111; Flück. & Hanb., Pharmacogr., pp. 120, 135; Monatsbericht Naturforsch. Berlin, 3 June, 1875.

Official Part and Name.—Olibanum; the gum-resin (I. P.). In this Pharmacopœia its botanical source is given as *Boswellia* (*Plösslea*) *floribunda*, but this is incorrect, as the gum-resin of that tree is not collected, as stated above. It is not official in the British Pharmacopœia or the Pharmacopœia of the United States; but it was formerly recognised in both the London and Edinburgh Pharmacopœias.

Collection and Commerce.—Olibanum is the *Frankincense* of the ancients, and the *Lubân*, a name signifying *milk*, of the Arabs. The manner of its collection in the Somali Country has been thus described by Cruttenden:—About the end of February or

beginning of March, the Bedouins visit all the trees in succession, and make a deep incision in each, peeling off a narrow strip of the bark for about five inches below the wound, when a copious milky juice exudes. At the end of a month another and deeper incision is made in the same place, and the operation is again repeated at the end of another month, soon after which the exudation is regarded as having acquired a proper consistence, and is then collected by parties of men and boys, who scrape the large clear globules into a basket, whilst the inferior quality that has run down the tree is packed separately. When first taken from the trees olibanum is very soft, but it quickly hardens. During the hot season the mountains are visited in this manner every fortnight, the trees producing larger quantities as the season advances, until the middle of September, when the first shower of rain puts an end to its collection that year.

Carter has described its collection in Southern Arabia as follows:—"The gum is procured by making longitudinal incisions through the bark in the months of May and December, when the cuticle glistens with intumescence from the distended state of the parts beneath; the operation is simple, and requires no skill on the part of the operator. On its first appearance the gum comes forth white as milk, and according to its degree of fluidity finds its way to the ground, or concretes on the branch near the place from which it first issued, from whence it is collected by men and boys employed to look after the trees by the different families who possess the land in which they grow."

The olibanum of commerce is exclusively collected in the Somali Country, and in Southern Arabia; and according to Captain Miles, the African Olibanum is considered better than the Arabian. The quantity which is obtained from the Somali Country in Eastern Africa is also much larger than that derived from Southern Arabia. From both the districts in which it is collected it is forwarded almost entirely to Bombay, the trade being essentially in the hands of the Banians. The quantity exported from Bombay, according to Flückiger and Hanbury, was

25,100 cwt. in the year 1872-73, of which 17,446 cwt. were shipped to the United Kingdom, and 6184 cwt. to China.

General Characters and Composition.—Olibanum varies much in appearance and quality. It occurs in the form of roundish, pear-shaped, oblong, club-shaped, irregular, or somewhat stalactitic tears, or in more or less agglutinated pieces, which vary in size from that of a pea to an inch in length; the rounded forms are the more common. The tears or pieces are covered by a whitish dust in consequence of their dry nature, and by rubbing against one another. Small portions of the yellowish-brown papery bark of the trees from which they were obtained are also often found attached to the flatter pieces, or imbedded in their substance. They have a semi-opaque appearance, and their colour is usually pale yellowish or brownish; but some of the better varieties of olibanum are composed of nearly colourless or somewhat greenish tears. The tears are brittle and their fractured surfaces are commonly dull and waxy, but sometimes they present a more or less sparkling appearance. When heated the pieces become more transparent; but when immersed in alcohol they assume an opaque white appearance. Olibanum has a terebinthinate, slightly bitter taste; and an agreeable, balsamic, somewhat terebinthinate odour, which becomes more evident and fragrant when it is subjected to a high temperature.

Olibanum consists of from 27 to 35 per cent. of *gum*, from 4 to 7 per cent. of *volatile oil*, and from 56 to 72 per cent. of *resin*, hence it is a *gum-resin*. The gum appears to be identical with gum arabic. The volatile oil was found by Stenhouse to have a sp. gr. of 0·866, a boiling point of about 355°, and an odour resembling, but more agreeable than, oil of turpentine. Kurbatow found that the oil was a mixture of two oils, one (*olibene*) being a pure hydrocarbon, and the other containing oxygen.

Medical Properties and Uses.—Olibanum is regarded as stimulant, diuretic, and diaphoretic, its action being more especially on the mucous membrane of the lungs. It is, however, seldom or ever employed at the present day, either in this country or in the United States. But it has been intro-

duced into the Pharmacopœia of India, and the Editor states, that "in subacute bronchitis, in chronic pulmonary affections, bronchorrhœa, and chronic laryngitis, it has been advantageously employed both internally and in the form of fumigation." Locally it has also been used with advantage as a stimulant in carbuncle, ulcerations, boils, &c.

As a fumigating agent it is employed to overpower unpleasant odours, and to destroy noxious vapours. Birdwood also states that:—"Nothing so quickly clears your bed in Bombay of mosquitoes as burning a little olibanum or myrrh in it."

Frankincense was an essential ingredient of the incense in use by the ancient Jews; and its principal consumption at the present day is in the preparation of the incense used in the Roman Catholic and Greek Churches.

Exodus xxx, 34.

Per. Mat. Med., vol. ii, pt. 2, p. 379; Per. Mat. Med., by B. & R., p. 878; Pharmacographia, p. 120; U. S. Disp., by W. & B., p. 1660; Kempthorne, in Pharm. Jl., vol. iv, ser. 1, p. 37, Royle, in Pharm. Jl., ser. 1, vol. v, p. 541; Vaughan, in Ph. Jl., ser. 1, vol. xii, p. 227; Birdwood, in Trans. Linn. Soc., vol. xxvii, pp. 111—148, and Pharm. Journ., vol. i, ser. 3, p. 163; Cruttenden, in Trans. Bombay Geograph. Soc., vol. vii (1846), p. 121; Carter, in Journ. of Bombay Branch of Roy. Asiatic Soc., vol. ii (1848), p. 380; Gmelin's Chemistry, vol. xiv, p. 390; Kurbatow, in Journ. Chem. Soc., 2nd ser., vol. ix, p. 695; Royle's Mat. Med., by J. Harley, p. 662; Bullet. Gen. de Therapeut., Fev. 28, 1861; Pharmacopœia of India, pp. 52 & 443; Delioux, in Brit. and For. Med. Chir. Rev., Jan., 1862, p. 242.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum, collected by Hildebrandt in Somali-land (no. 1381); the fruit added from a specimen from Aden in the Kew herbarium.

1. Extremity of a branch with terminal tuft of leaves and flowers. 2. A flower. 3. Vertical section of the same. 4. Calyx. 5. A stamen. 6. Transverse section of ovary. 7. Fruit. 8. The same after the fall of the valves. 9. Transverse section of the same. 10. A pyrene.

(2–9 enlarged.)

M. & N. Hanhart lith.

D. G. SAMODENDRUM SPORADANUM, Oliv.

N. Ord. Burseraceæ.

Tribe *Bursereæ*.

Genus Balsamodendrum,* *Kunth.* B. & H., Gen., i, p. 323 (and *Hemprichia*, p. 327); Berg, in Bot. Zeitung, 1862, p. 153; Baill., Hist., v, p. 310 (*Balsamea*, Gled. Includes *Protium*, W. & A.). About 15 species have been described, natives of sub-tropical and tropical Africa, Arabia, and Western India.

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59. Balsamodendrum Opobalsamum,† *Kunth, in Ann. Sc. Nat., ser.* 1, ii, *p.* 348 (1823).

Balessan, Bechan (Arabia). *Balm of Gilead. Balsam-Tree.*

Syn.—Amyris gileadensis *and* A. Opobalsamum, *Linn.* Balsamodendrum gileadense, *Kunth.* Balsamodendron Ehrenbergianum, *Berg.* Protium gileadense, *Lindl.* non *W. & A.* Balsamea Opobalsamum, *Baillon.*

Figures.—Bruce, Travels (1790), Appendix, 2nd and 3rd plates; Woodville, t. 214, cop. in Steph. & Ch., t. 157; Nees, t. 356; Berg & Sch., t. 29 d (*B. Ehrenbergianum*); Baill., l. c., f. 277–279.

Description.—A shrub or small spreading tree, 10—12 feet high, with long, slender, wand-like, irregular branches, without spines; bark smooth, striate, orange- or purplish-brown, the outer layers peeling off on the old stems; the twigs irregularly set with short, wart-like branchlets, closely marked with leaf-scars, and producing at their extremities the leaves and flowers. Leaves usually scanty, in fascicles of 2—6 from the extremities of the rudimentary branchlets, generally about an inch long including the long, slender petiole, trifoliolate; on the young shoots of the year alternate, with long internodes, often pinnately 5-foliolate; leaflets scarcely ½ inch long, sessile, narrowly oval or obovate, acute, entire, thin, veined beneath, pale glaucous green, usually quite glabrous, sometimes densely pubescent on both sides, the terminal one the largest. Flowers imperfectly dicœcious, on short pedicels jointed to

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* The *βαλσάμου δένδρον* of Theophrastus.

† *Opobalsamum, ὀποβάλσαμον* in Dioscorides, the juice flowing from the Balsam-tree.

longer peduncles, which are solitary or 2—3 together at the extremities of the stunted branches, with several small, ovate bracts at the forks, whole inflorescence shorter than the leaf-petiole. Calyx cup-shaped, smooth, persistent, with 4 faint distant teeth or shallow lobes. Petals 4, alternating with the calyx-teeth, oblong, acute, erect, reddish, valvate in the bud. Male flowers :—stamens 8, hypogynous, inserted beneath a ring-shaped hypogynous disk surrounding the rudimentary ovary, about as long as petals, the alternate 4 often shorter, anthers large, 2-celled ; pistil rudimentary. Female flowers:—stamens usually 4, about half as long as the petals, disk small ; ovary longer than the stamens, ovoid, tapering, 2-celled, with 2 axile ovules in each cell, stigma large, capitate. Fruit slightly compressed, ovoid or somewhat pyriform, apiculate, about $\frac{3}{8}$ inch long, stalked, surrounded at the base by the persistent calyx, glabrous, epicarp leathery, ultimately dehiscing into 2 or partially into 4 boat-shaped valves, mesocarp (?) yellowish-white, pulpy, irregularly cup-shaped, and extending up the pyrenes on 4 sides, but not covering them, fertile pyrene very hard, black, containing a single seed, with the fibrous, cord-like axis of the fruit running up between it and the other scale-like, adpressed, abortive pyrene and attached to the top of both. Seed solitary, grooved down one side, testa thin, yellow ; embryo large with plaited cotyledons, and a short, thick, superior radicle ; no endosperm.

Habitat.—This species of *Balsamodendrum* appears to have a somewhat extensive range on both sides of the Red Sea, south of 22° north latitude, and is in many places one of the most frequent shrubs. From Africa we have seen specimens from several places on the Nubian Coast and the islands near, from Abyssinia both from the coast and inland hills, and from Somali-land. In the latter country, according to Hildebrandt, it is called "Dossémo" by the natives, and grows at an elevation of 1100—1600 metres. From the Asiatic side, we have specimens from Ghizan on the Red Sea in Arabia collected by Ehrenberg and from the neighbourhood of Aden. Forskal's specimens, merely labelled "ex oriente," are said to have been collected in the province of Yemen in Arabia, and there is abundant evidence to show that the

tree grows in the interior of the latter country. It is not now known to occur in Palestine, and the famous trees of antiquity mentioned in the Scriptures and by old writers may probably have been cultivated there.

From want of satisfactory and complete specimens the species of this genus are in considerable confusion. We agree with Professor Oliver in combining *B. Ehrenbergianum* with the present species; indeed they appear identical. Both Berg and Schweinfurth, however, consider the plants distinct; and the name was bestowed by Berg on the specimens from Ghizan, above noticed, which the collector labelled as certainly the source of myrrh. These were in fruit only. Schweinfurth says that *B. Ehrenbergianum* is confined to Asia.

As understood here there is very little variability in the species, the greater or less pubescence of the usually glabrous leaves, and the occasional production of an extra pair of leaflets being the chief. The flowers appear with the young leaves in February and March, and the fruit is ripe in May and June, by which time the branches are not unfrequently leafless.

In the above description of the fruit and seed we have followed the view commonly held as to the signification of the different parts. The pulpy layer within the epicarp—which seems to have escaped the notice of previous describers of the plant—has a remarkable form, and might be readily taken to be an arillus, were it not for the remains of the second abortive pyrene.

Little or nothing more is known at present (May, 1876) of *B. Myrrha*, Nees, than the poor figure in Nees, t. 357 (a portion of which is reproduced in Pharm. Journ., 1873, p. 822). This also was collected as a myrrh-producing shrub at Ghizan by Ehrenberg in 1820—6. It is said not to be found on the African side of the Red Sea. So far as the description and figure enable us to judge, it must be a very close ally of the Indian *B. Berryi*, Arn. (*Protium gileadense*, W. & A.), if not the same as that species.

Prof. Baillon adopts the name *Balsamea*, Gleditsch, for this genus, the date of which is 1782 (Berlin Gesellsch. Naturforsch.

Freunde, vol. iii, p. 103, t. 3, fig. 2). It does not, however, appear from the description and figure given, that Gleditsch really had this plant under his observation.

Berg, in Bot. Zeitung, 1862, p. 163; Oliver, Fl. Trop. Africa, i, p. 326; Schweinfurth, in Petermann, Geograph. Mitth., 1868, p. 127; Boiss., Fl. Orient., ii, p. 2; Lindl., Fl. Med., p. 169; D. Hanbury, in Pharm. Journ., April, 1873, p. 821.

Official Part and Name.—MYRRHA; a gum-resinous exudation from the stem of Balsamodendron Myrrha, *Ehrenb.* (B. P.). The gum-resinous exudation from the stem of Balsamodendron Myrrha (I. P.). MYRRHA; a gum-resinous exudation from the stem of Balsamodendron Myrrha (U. S. P.).

It will be noticed that the plant now under description is not the official one of the Pharmacopœias; but in the uncertainty as to the botanical source of myrrh it will be better for us to describe that drug in the present place, although we shall probably figure and describe the so-called *Balsamodendrum Myrrha,* hereafter.

Collection and Commerce.—According to Ehrenberg, myrrh exudes from the bark like cherry-tree gum. It is at first soft, of an oily nature, and of a yellowish-white colour; but it gradually assumes a golden tint, and ultimately, as it hardens, becomes reddish. But Ehrenberg says nothing about the collection of this myrrh by the natives, although he describes it as of good quality; and it is now certain that the myrrh of commerce is not brought from the country about Gison or Ghizan, in Arabia, on the eastern shore of the Red Sea, which was the district visited by Ehrenberg. Indeed, at the present time, it would appear, from information obtained from Vaughan, Harris, Cruttenden, and others, that true myrrh is not obtained in Arabia at all, but from Africa, and that it is chiefly, if not entirely, collected in the Somali country and the districts around Harar or Hurrur. From these parts it is brought to the great fair of Berbera, where it is purchased by the Banians of India, and forwarded to Bombay. From recent information communicated to the Pharmaceutical Journal by Dr. Dymock, it would

appear that the bags or bales which contain the myrrh when opened in Bombay, are found to be made up of myrrh of various qualities, mixed with another allied gum-resin, which is probably, according to Dymock, the *opaque bdellium* of Guibourt; it is termed in the local markets *meena hărma*, true myrrh being distinguished under the name of *kărăm*. In Bombay the contents of the package are sorted, the myrrh being separated from the bdellium, and then the best myrrh is picked out and forwarded to Europe; the darker pieces constitute myrrh of second quality; and the refuse is exported to China. Nearly all the myrrh used in Europe and elsewhere, is obtained from Bombay. In the year 1872—73 the exports amounted to 546 cwt., of which 493 cwt. were forwarded to the United Kingdom.

General Characters and Composition.—Myrrh is in irregular roundish pieces, varying in size from small grains up to that of a hen's egg, or rarely, as large, or even larger, than a man's fist. The pieces either consist of distinct tears, or are agglutinated masses of tears. Externally, the masses of myrrh have an opaque appearance, a reddish-brown or reddish-yellow colour, and are covered by a fine powder. They are brittle, and when broken the fractured surface presents an irregular, somewhat translucent, rich brown, moist, and oily appearance; and in many cases exhibits opaque whitish spaces or striæ, which the ancients compared to the white marks at the base of the finger-nails. The odour of myrrh is peculiar, aromatic, and agreeable; the taste bitter, aromatic, and acrid. The finer pieces are sold as *picked myrrh*, and were formerly distinguished as *Turkey myrrh*.

Myrrh is essentially composed of *gum*, *resin*, and *volatile oil*. It is only partially soluble in water, alcohol, or chloroform; the first liquid taking up the gum principally, and the two latter the resin and oil. When triturated with water myrrh forms a brownish-white milky emulsion. The *gum*, which resembles gum arabic, although not altogether identical with it, constitutes on an average from 40 to 50 per cent., but sometimes over 60 per cent. The *volatile oil*, which may be readily obtained by the distillation of myrrh with water, is a yellowish, somewhat viscid liquid, with

a powerful odour of myrrh, and having a specific gravity, according to Flückiger and Hanbury, of 0·988, but Gladstone found it to be heavier than water. The amount of oil obtainable has been variously estimated at from ¾ to over 3 per cent. The *resin* is readily soluble in alcohol or chloroform, but only partially soluble in alkalies or bisulphide of carbon; its amount probably averages about 25 per cent, but it has been found by different chemists to vary from 23 to 44 per cent. When first moistened by alcohol, and then by hydrochloric acid, the resin assumes a violet hue.

Adulterations and other Kinds of Myrrh.—The inferior qualities of myrrh are often adulterated with various gums, resins, &c. These may be usually distinguished by the transparency of their fractured surface, and by their deficiencies of odour and taste; they are fully described in special treatises on the Materia Medica, and need no further mention from us. But besides the true myrrh, as hitherto described, there are two other varieties of myrrh, which we must briefly refer to. These are commonly distinguished under the names of *Arabian Myrrh* and *East Indian Myrrh*. Both varieties are frequently sold by dealers as true myrrh.

1. *Arabian Myrrh.* This is collected to the eastward of Aden, in Southern Arabia, and is probably the produce of a species of *Balsamodendrum* closely allied to that from which the true or African Myrrh is derived. It is forwarded from Makulla and Aden to Bombay, where its trade name is *meetiga;* it is mostly sold in India as true myrrh. It occurs in irregular gummy-looking masses, the largest which are formed by the agglutination of small, shiny, translucent tears, rarely exceeding 1½ inches in length. It is more brittle than true myrrh, and when broken, although its fractured surface much resembles that drug, the whitish opaque markings so characteristic of it are absent. Arabian myrrh is also more gummy than African myrrh, but it possesses a similar taste and odour.

2. *East Indian Myrrh,* the *Bissa Bôl* of the Arabs. This is collected like true myrrh in the Somali country, and is also doubtless the produce of a species of *Balsamodendrum,* allied to

that from which the true myrrh is derived. It is forwarded to Aden, Makulla, and other ports of Arabia, &c., and thence to India and China, where it is chiefly consumed. When of good quality it closely resembles true myrrh in its external characters, but its odour, which has been compared to that of mushrooms, at once distinguishes it. As usually seen it is generally regarded as a very inferior dark-coloured kind of myrrh.

Medical Properties and Uses.—Myrrh is a stimulant tonic, and expectorant, and is also commonly regarded as possessing anti-spasmodic and emmenagogue properties. When combined with iron and aloes, myrrh is a remedy of great value in amenorrhœa. It is also frequently administered in leucorrhœa and chlorosis; and occasionally, with benefit, in chronic bronchitis, phthisis, and atonic dyspepsia. Locally applied it is a useful stimulant in spongy gums, the aphthous sore mouths of children, and various kinds of indolent ulcers.

Besides its use in medicine, myrrh has been employed from the earliest times as an ingredient in incense and perfumes, &c. It entered into the composition of the holy oil in use by the Jews; and also into the *Kyphi* of the Egyptians, which was used in fumigations, and for embalming, &c.

Balm of Gilead.—The oleo-resin known under the names of Balm or Balsam of Gilead, Balm of Mecca, and Opobalsamum, which is supposed to be the Balm of the Old Testament, is said by some authors to be the produce of Balsamodendrum Opobalsamum. Balsam of Gilead is a whitish, viscid, turbid liquid, of an agreeable odour when fresh, but it thickens by age and becomes of a yellow colour. Its use has become obsolete in Europe, although formerly the most wonderful properties were attributed to it. But it is still esteemed in the East for its fragrance and medicinal properties.

Stacte or Liquid Myrrh.—We have no positive evidence of the source of the *liquid myrrh* or *stacte* of the ancients, but it is said by Pliny to be a spontaneous liquid exudation of the myrrh tree, of even more value than myrrh itself. Formerly, it was obtainable in large quantities, but, as stated by Flückiger and

Hanbury, no drug of modern times has been identified with it. Stacte entered into the composition of the holy incense in use by the Jews.

Genesis xxxvii, 25; Exodus xxx, 23 and 34; Solomon's Song iii, 6; Jeremiah viii, 22.

Per. Mat. Med., by B. & R., p. 872; Pharmacographia, p. 124; U. S. Disp., by W. & B., p. 571; Pharm. Journ., 1 ser., vol. xii, p. 226, vol. iii, 3rd ser., p. 821, and vol. vi, 3rd ser., p. 661; Ann. de Chimie, vol. lxvii, p. 72; Archiv der Pharm., vol. lxi, p. 1, and vol. xliii, p. 304; Am. Journ. of Pharm., vol. xviii, p. 228.

DESCRIPTION OF PLATE.

Drawn from specimens in the British Museum, collected in Nubia and Abyssinia by Schweinfurth.

1. Branch of a male plant in flower.
2. Vertical section of a male flower.
3. Branch with fruit.
4. A fruit.
5. Transverse, and—6. Vertical section of fruit.
7. Fruit with the epicarp removed, showing the aril-like mesocarp (?).
8. Portion of an old branch with young shoots of the year.

(2, 4–6 enlarged.)

BALSAMODENDRUM MYRRHA, *Nees.*

N. Ord. Burseraceæ.

Tribe *Bursereæ*.

Genus Balsamodendrum, *Kunth*.

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60. Balsamodendrum Myrrha,* *Nees, Beschreib. Officinell. Pflanzen, t.* 357 (1829).

Didin; Didthin (Somali). *Myrrh.*

Figure.—Nees, t. 357, cop. in Royle, Mat. Med., ed. 2, fig. 56, Pharm. Journ., 1873, p. 822, Carson, Ill. Med. Bot., t. 20, and elsewhere.

Description.—A low, stunted bush or small tree, not reaching more than 9 feet in height, but with a trunk of considerable thickness, and numerous irregular, knotted branches, smaller branchlets clustered, stout, spreading nearly at right angles, and terminating in a sharp spine; bark smooth, thin, flaking off in small portions, pale orange-brown, becoming ash-grey when detached. Leaves few, in small fascicles at the ends of short, rudimentary, wart-like branchlets, shortly stalked, small, about ½ inch long, trifoliolate, leaflets sessile, very unequal, the two lateral ones minute and readily overlooked, but always (?) present, oval, acute, entire, the terminal one nearly ½ inch long, obovate-oval, narrowed at the base, obtuse at the apex, with a few large, shallow, irregular serrations at the upper part or nearly entire, quite glabrous on both surfaces. Flowers not seen. Fruit as in the last species?

Habitat.—This, the true Myrrh tree, was first collected by Ehrenberg in Hemprich's expedition, 1820-5, at Ghizan or Gison on the coast of the Red Sea, in Southern Arabia, in lat. 17° N. This is a bare basaltic district, with very scanty vegetation, and from the intense heat and want of water has received the name of "Tehama," which means hell. The specimens were collected in March, and had no flowers.

No other botanist appears to have again identified the species until 1873, when Hildebrandt obtained a specimen in Somali-

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* *Myrrha*, Greek *μύρρα*, the classical name of the gum-resin.

land. This was also collected in March, and was not in flower. It was pointed out to the traveller by the natives, and he himself saw the gum-resin exuded spontaneously on the stem. The bushes grow on very hot and sunny declivities, at an elevation of from 1500—3000 feet, in the Ahl and Serrut mountains, which run parallel with the north coast of Somali-land, and at a short distance from it.

A large branch of apparently the same species was obtained by Mr. Wykeham Perry in Somali-land, in 1878, near the parallel of 47° E. long., and sent to Kew in a living state, but it has since died. It had no leaves or flowers upon it.

Whether the plant which yields the myrrh called by Hanbury "Arabian Myrrh," and collected in the country of the Fadli Arabs, in South Arabia, east of Aden, is the same species, or, as Hanbury supposes, a different one, cannot at present be decided, another specimen from Mr. Wykeham Perry collected in that region being insufficient for the purpose. It is somewhat less spinous than the Somali plant.

The source of African Myrrh may now be considered as settled, but the botany of the subject is still in a very unsatisfactory state. The above description of *B. Myrrha* is chiefly made from Hildebrandt's unique specimen, kindly lent for the purpose by the authorities of the Royal Berlin Herbarium, from which, also, the figure is drawn. Ehrenberg's original specimens were also sent at the same time. But the whole available material is quite insufficient to enable a sound opinion to be formed as to whether *B. Myrrha* is a distinct species. Nees figures and describes an acuminate fruit; we could find no fruit on either of Ehrenberg's specimens,* but the single fruit lying loose in the box containing Hildebrandt's specimen, and presumably belonging to it, is, as seen in the figure, blunt at the point. The only characters for *B. Myrrha* are found in its very divaricate and spiny branches and its shortly stalked leaves with the lateral leaflets very small and

* Three sheets of *B. Myrrha*, Nees, were sent, all poor and imperfect specimens. It is not certain that the actual specimen figured by Nees was among them.

the terminal ones more or less toothed; none of these are of an absolute nature, and it must rest with further examination of more complete specimens to confirm or weaken their value.

Other species of this genus afford analogous products. The very little known *B. Kataf*, Kunth (*Amyris*, Forsk., *Balsamophlæos*, Berg), is figured in Nees, t. 358, and seems to be a distinct species, though confounded by Lindley, De Lanessan, and other writers with *B. Myrrha*, and by Oliver with *B. Playfairii*. It was discovered by Forskål in his fruitful journey in Southern Arabia, in 1763; his *A. Kafal* is doubtless the same species, and to it also is probably to be referred *Hemprichia erythræa*, Ehrenb., originally found in the Isle of Ketumbul, on the Red-Sea coast of Arabia, and since by Schweinfurth on the opposite Nubian shore, at Ras Rauai. It is likely that the plant grows also in Somaliland, and that it will prove to be the source of the kind of myrrh called "Beesa-bol" or "Bissa-bol."

B. Kua, R. Br., a small spiny species as yet undescribed, but allied to *B. Myrrha*, and a native of Abyssinia, where it was collected by Salt, was found by him to yield a myrrh.

B. Mukul, Hook., is found in S. Arabia, Beloochistan, and Scinde, and is figured in Hook., Jour. Bot. i (1849), t. 8. It affords Indian "Googul" or "Bdellium;" whilst "African Bdellium" is the produce of *B. africanum*, Arn. (*Heudelotia*, Rich.), a species widely diffused, under many forms, throughout tropical Africa, and figured in Guill. and Perr., Fl. Senegamb., t. 39.

Another Somali species is *B. Playfairii*, Hook. f., discovered there by Capt. Playfair in 1862, which yields the gum called "Hotai," for which "opaque Bdellium" is another name.

Forskål, Fl. Ægypt. Arab., p. 80; Nees & Eberm., Handb., iii, p. 122; Royle, Mat. Med., ed. 2, p. 384 (1832); Roth, in Buchner's Repertorium, ser. 2, xxxv, p. 19 (1844), reprod. in Hanbury's Science Papers, p. 499; Hook., Journ. Bot., i, p. 257 (1849); Berg, in Bot. Zeit (1862), p. 153; Oliver, Fl. Trop. Africa, i, pp. 326, 329; Hanbury, in Pharm. Journ., April, 1873, p. 821; Marchand, in Adansonia, vii, p. 258; Cooke, Report on Gums of Indian Museum, p. 67 (1874); Flück. & Hanb., Pharmacogr., p. 124; Hildebrandt, in Sitzungsber. d. Gesellsch. naturforsch. Freunde Berlin, Nov., 1878, p. 196; Trimen, in Pharm. Journ., May, 1879, p. 893.

Official Part and Name.—MYRRHA; a gum-resinous exudation from the stem of Balsamodendron Myrrha, *Ehrenb.* (B. P.). The gum-resinous exudation from the stem of Balsamodendron Myrrha (I. P.). MYRRHA; a gum-resinous exudation from the stem of Balsamodendron Myrrha, *Nees* (U. S. P.).

Collection, Characters, Composition, Medical Properties, and Uses.—All details in reference to Myrrh and its allied gum resins, in these particulars, are given by us under "Balsamodendrum Opobalsamum."

Per. Mat. Med., vol. ii, pt. 2, p. 381; Pharmacographia, p. 124; Royle, Mat. Med., by J. Harley, p. 666; Vaughan, in Pharm. Jl., ser. 1, vol. xii, p. 226; Cruttenden, Trans. Bombay Geog. Soc., vol. vii, p. 123; A. W. Bennett, in Pharm. Journ., vol. vi, ser. 3, pp. 62 & 83; Dymock, in Pharm. Journ., vol. vii, ser. 3, p. 310, and in Proc. Amer. Pharm. Assoc., vol. xxv (1877), p. 219; Trimen, in Pharm. Journ., vol. ix, ser. 3, p. 893.

DESCRIPTION OF PLATE.

Drawn from a specimen (kindly lent by the authorities of the Royal Herbarium, Berlin) collected by Hildebrandt in Somali-land (no. 893 e).

1. Portion of a branch with leaves.
2, 3. A separate leaf.
4. A fruit.

(3 enlarged.)

CANARIUM COMMUNE, *Linn*

M&N Hanhart imp

N. Ord. Burseraceæ.

Tribe *Bursereæ.*

Genus Canarium,* *Linn.* B. & H., Gen., i, p. 324; Baill., Hist. Pl., v, p. 312. There are over 50 species, chiefly natives of tropical Asia.

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61. Canarium commune, *Linn., Mant. Plant., p.* 127 (1767).

Manila Elemi. Java Almond.

Syn.—C. Mehenbethene, *Gaertn.* C. zephyrinum, *Miquel.*

Figures.—Rumph., Herb. Amboin., ii, tt. 47 & (*C. zephyrinum*) 48; Annals of Botany, i, t. vii, fig. 2 (flowers only); Gaertn., Fruct., ii, t. 102 (fruit).

Description.—A large tree, attaining 40—60 feet in height, with a stout trunk; bark smooth, pale or whitish. Leaves very large, alternate, widely spreading, long-stalked, 1 foot or more long, pinnate with 4 or 5 pairs of opposite leaflets and a terminal one, the rachis stiff, cylindrical, striate, thickened and somewhat kneed at the origin of the leaflets, smooth; stipules large, wing-like, inserted obliquely at the very base of the rachis, spreading, about 1 inch long, roundish-oval or oblong-oval, entire or toothed or serrate, thick, smooth, with numerous parallel veins, deciduous; leaflets on smooth stalks which are nearly an inch long, blade 4—8 inches long (the lower ones the smallest), ovate or oblong-ovate, rounded at the base, tapering, and produced into a long, acuminate, blunt apex, quite entire, smooth, thick, with the mid-rib prominent beneath, and about 12 spreading, strongly-marked, secondary veins which are curved and confluent within the margin, dull green, paler beneath. Flowers rather small, bi- or unisexual, shortly stalked, arranged in large, stiff, open, pyramidal, few-flowered, terminal or axillary panicles, peduncles and pedicels finely silky, bracts large, rounded, silky, enveloping the young flowers, quickly caducous. Calyx about $\frac{3}{8}$ inch long, campanulate, with 3 very shallow, broad, obtuse but apiculate segments, valvate in the

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* *Canarium*; from *Kanari*, the Malay name.

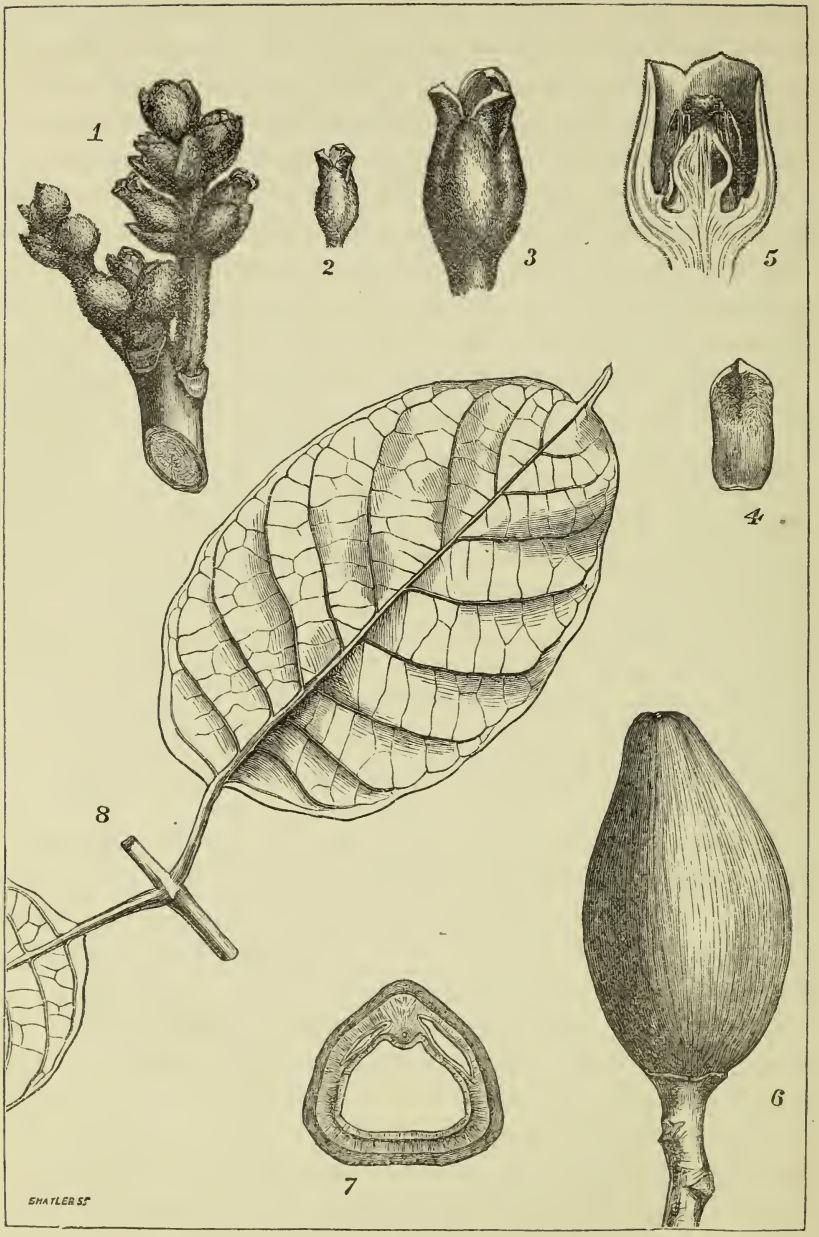
bud, very thick and tough, externally covered with a yellowish silky down. Petals 3, alternate with the lobes of the calyx, hypogynous, erect, half as long again as the calyx, oblong-spathulate, rounded at the apex but bluntly apiculate, thick and fleshy, thinning to the edges, concave within, convex outside, silky on both surfaces but especially outside, white. Stamens 6 or 8 in one row, inserted around the rudimentary pistil, filaments very short, distinct or slightly united at the base, anthers much longer than the filaments, cordate at the base, acute at the apex, introrse. Ovary (not seen properly developed) ovoid, 3-celled, with 2 ovules in each cell, attached collaterally to the upper part of the axis; style short and thick, exceeding the stamens, stigma capitate, 3-lobed. Fruit about the size of a plum, $1\frac{1}{4}$—$1\frac{1}{2}$ inch long, supported on the remains of the everted calyx, pointed at the top, ovoid, bluntly trigonous, smooth, dark blue-green, with a scanty fleshy epicarp, and a very hard, bony, thick, indehiscent endocarp, usually 1-celled by abortion of the other two, one or both of which are, however, often more or less developed. Seed (not seen) solitary in the cell, as large as an almond, testa membranaceous, cotyledons very large, fleshy and oily, very deeply cut almost to the base into 3 blunt oblong lobes which are variously folded and packed together, radicle superior, long, cylindrical, no endosperm.

Habitat.—The true *C. commune*, Linn., of which the above is a description, is a native of Amboyna, Luzon, Sunda, the Moluccas, and Penang. It is also cultivated in Java, and has been grown in the Gardens at Calcutta, where, however, it did not thrive. We cannot certainly identify it as the source of Elemi, but it is probably the "Terebinthus Luzonis prima" of Camelli, in Ray's 'History of Plants,' which he says is called *Laguaan*, *Lauvan*, and *Pagsaingan* by the natives, and *Arbol de la Brea* by the Spaniards. His drawing in the British Museum (MSS. Sloane, 5288, fol. 227) fairly represents *C. commune*. It is also the tree described by Rumphius under the same name, who distinguishes 4 kinds, of which one is well figured. The "C. zephyrinum" of the same author does not appear to be separable by any very definite characters.

Brea is the Spanish name for pitch or resin, and it appears that more than one tree is called *Arbol de la Brea* in the Philippines. We are indebted to Mr. H. Ricketts, H.B.M. Consul at Manila, for specimens of the Brea tree of that district, which may be probably that from which Elemi is obtained. But we have no certain information on this point, and the specimens sent are fragmentary and merely sufficient to show the tree to be a species of *Canarium* and at least very near *C. commune*. Mr. Ricketts informs us that it is very rare or almost unknown close to Manila, but is abundant in the hills about twenty miles off, where it extends from the valleys to an elevation of 2000 feet. The tree is 30 or 40 feet high, or as tall as a large elm, and the greenish flowers appear in April and May ; the wood is very hard, and abundance of the white resin (brea) exudes from the cut bark. Two kinds of this tree are distinguished and called in Tagalog *Saīn* and *Bĭlĭ ;* the latter has larger leaves and affords the best brea. The woodcuts on the next page show the young flowers (Figs. 1, 2), fruit (Fig. 6), and a leaflet (Fig. 8) of the Saīn variety, and the tree appears to differ from *C. commune* only in its smaller and less tapering leaflets, more deeply-lobed calyx, and longer and narrower fruit. Fig. 3 shows a flower enlarged, Fig. 5 a vertical section of the calyx and pistil, Fig. 4 a petal, and Fig. 7 a transverse section of the fruit (the seed was rotten). Unfortunately the specimens did not show the stipules.

These specimens appear to agree with another plant described by Camelli as "Terebinthus Luzonis altera," which he states affords a more copious white and odoriferous resin than the Laguaan. The native names he gives for this are *Sagnan, Pilis,* and *Pilavay,* the two first of which may well be other forms of the names *Saīn* and *Bĭlĭ*. Camelli's excellent unpublished drawing of the plant (MSS. Sloane, l. c. fol. 141) agrees well with Mr. Ricketts' specimens.

If distinct from *C. commune,* we are not able to refer this with certainty to any of the numerous described species of the genus, nor does it quite fit with either of the plates of Rumphius ; it may perhaps be the species imperfectly described by Blanco under the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name of *C. album* (Fl. Filip., ed. 1, p. 793; ed. 2, p. 546), which he states is very common in all the islands, and affords the white "Brea de Piles" much used for caulking ships. The Tagalog names of this tree are said to be *Proa* or *Pilaui*, the latter doubtless the same as Camelli's *Pilavay*. It is the *C. luzonicum* of Blume.

The authors of 'Pharmacographia' state that Manila Elemi is derived from *Icica Abilo*, Blanco, a tree which, as they rightly state, is completely unknown to the botanists of Europe,* but which, according to them, "the Spaniards call Arbol a brea." We are not aware of the grounds upon which this determination has been made, further than that Blanco says that the tree produces abundance of a fragrant resin. There is yet much to be done in the correct determination of the Elemi trees of the East.

Other species of Canarium afford resinous products. *C. strictum*, Roxb., gives the Black Dammar of Western India; and *C. edule*, Hook. f., the "Mubafo" tree of West Tropical Africa, yields the resin known as African Elemi.

Raii, Hist. Plant., App., pp. 60 and 67 (1704); Rumph., Herb. Amboin., ii, p. 146; Blanco, Fl. de Filip., ed. 2, pp. 256, 546; Koenig, in Annals of Bot., i, p. 360; Roxburgh, Fl. Indica, iii, p. 137; DC. Prod., ii, p. 79; Miquel, Fl. Ind. Batav., i, pt. 2, p. 643; A. W. Bennett, in Fl. Brit. India, i, p. 531; Lindl., Fl. Medica, p. 107; Flück. & Hanb., Pharmacogr., p. 129.

Official Part and Name.—Elemi; a concrete resinous exudation, the botanical source of which is undetermined, but is probably Canarium commune, *Linn.* (B. P.). The concrete resinous exudation of Canarium commune (I. P.). It is not official in the Pharmacopœia of the United States.

Varieties and Commerce.—At different periods the resinous products of several trees have been described under the name of Elemi; the more important of which being Mexican or Vera Cruz Elemi, obtained from *Amyris elemifera*, Royle; Brazilian Elemi from several species of *Icica*; and the present official variety,

* The description (Blanco, Fl. Filip., ed. 2, p. 256) in some respects suggests a species of *Garuga*.

known as Manila Elemi, which has been conjecturally referred to *Canarium commune*, Linn., in the British Pharmacopœia, but, as shown in our botanical description, without any reliable data. Of late years, the Mexican and Brazilian varieties have disappeared from commerce; the only one now obtainable being that known as Manila Elemi from being chiefly, or entirely, imported from Manila.

General Characters.—Manila elemi, when fresh and pure, is a soft, granular, resinous, colourless substance; but it is often mixed with fragments of wood and other impurities, and is also sometimes of a greyish or blackish colour from the presence of carbonaceous matter. By keeping and exposure to the air, it becomes harder, and of a pale yellow tint. Its odour is strong and fragrant, somewhat resembling fennel and lemon; and it has a bitter, disagreeable, pungent taste. At about the temperature of 212°, it becomes soft, and if further heated it readily fuses and forms a clear resinous substance. Moistened with spirit of wine it breaks up into small particles, which, when examined by the microscope, present a crystalline appearance.

Composition.—Manila elemi has been elaborately examined by Baup, Flückiger, E. Buri, and other chemists, and the results of their experiments show, that it is essentially composed of *volatile oil;* three crystalline principles which have been named, *bryoidin, amyrin,* and *elemic acid;* and two *amorphous resins,* one being of an *acid character,* and the other *indifferent.* The *volatile oil,* which may be readily obtained by the distillation of elemi with water, to the extent of about 10 per cent. of the drug; is described by Flückiger, as fragrant, colourless, neutral, dextrogyre, and of a specific gravity at about 60°, of 0·861. *Bryoidin* exists in but small proportion; it is described as a bitter, crystalline, neutral principle, slightly soluble in cold water, but freely in hot water, alcohol, and ether. *Elemic acid* is also present, but to a small extent, and has undoubted acid properties, forming a crystalline salt with potassium, and amorphous salts with sodium and some of the metals. *Amyrin* exists in elemi to the extent of from 20—25 per cent. or more. It may be obtained by treating elemi

in cold alcohol, when amyrin is left behind in microscopic needle-shaped crystals, the other constituents being dissolved. It melts at about 350°, is insoluble in water, but readily soluble in hot alcohol, and in ether and chloroform. It is colourless when pure, and neutral. The *amorphous resins* appear to constitute about 60 per cent. of elemi; they are readily soluble in cold alcohol.

Medical Properties and Uses.—It has stimulant properties analogous to those of the turpentines; but it is only employed externally. Its principal or sole use in this country is in the form of the official ointment of elemi, which is applied as a stimulant to old and indolent ulcers, and to promote the discharge from issues and setons. In the United States it is but very rarely employed; but on the Continent it is more esteemed, being an ingredient in numerous official plasters and ointments.

Other Uses of Canarium commune.—The seeds known as *Java Almonds* yield by expression a bland fixed oil, which resembles almond oil, and has been recommended as a substitute for it. The emulsion from the seeds has also been used in Indian practice instead of the corresponding official Almond Mixture. In Java the oil is used for burning, and when fresh is mixed with food. Bread is also made from the seeds in Celebes.

Per. Mat. Med., vol. ii, pt. 2, p. 385; U. S. Disp., by W. & B., p. 376; Pharmacographia, p. 129; Flückiger, in Pharm. Journ., vol. v, ser. 3, p. 142, and Proc. Amer. Pharm. Assoc., vol. xxiii (1875), p. 216; Bennett, in Pharm. Journ., vol. vi, ser. 3, p. 102; E. Buri, in Pharm. Journ., vol. vii, ser. 3, p. 157, from Neues Repert. Pharm., vol. xxv, pp. 193—204, and in Pharm. Journ., vol. viii, ser. 3, p. 601.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected in Amboyna by Chr. Smith; the fruit from a specimen from Java in the Pharmaceutical Society's Museum.

1. A branch with panicle of flowers and a leaf.
2. A flower.
3. Calyx.
4. Inner, and—5. Outer surface of a petal.
6. Fruit.

M & N Hanhart imp

MELIA AZADIRACHTA Linn.

N. Ord. MELIACEÆ. Lindl., Veg. Kingd., p. 463; Le Maout & Dec., p. 333; Baill., Hist. Pl., v.

Tribe *Melieæ*.

Genus **Melia**,* *Linn.* B. & H., Gen., i, p. 332; Baill., l. c., p. 493. About 5 species are known, natives of the hot parts of Asia and Australia, and one widely spread through both hemispheres.

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62. Melia Azadirachta,† *Linn., Sp. Plant., ed.* 1, p. 385 (1753).

Nim, Neem (Hindostan). *Margosa.*

Syn.—Azadirachta indica, *Juss.* Melia indica, *Brandis.*

Figures.—Rheede, Hort. Malabar., iv, t. 52; A. Jussieu, Mem. Mel., t. 2; Wight, Ic. Fl. Ind., t. 17; Beddome, Fl. Sylv., t. 13.

Description.—A tree 40—50 feet or more high, with a straight trunk and long spreading branches forming a broad round crown; bark grey, with numerous oblique furrows and small scattered tubercles; young twigs glabrous. Leaves numerous, alternate, exstipulate, 9—15 inches long, on long slender petioles, pinnate, leaflets 8—17, alternate or opposite, very shortly stalked, 1½—3 inches long, ovate-lanceolate, attenuate at the apex, unequal at the base, the upper half much larger than the lower and the leaflet in consequence more or less falcate, coarsely and bluntly serrate, smooth, dark green. Flowers small, numerous, shortly stalked, arranged in long, slender, very lax, elongated, stalked, axillary panicles, shorter than the leaves, bracts minute, deciduous. Calyx very deeply divided into 5 wide-spreading, imbricate, rounded, blunt, ciliate, smooth thin segments. Petals 5, imbricate and oblong-oval in the bud, when mature $\frac{1}{6}$ inch long, widely spreading, oblong-spathulate, somewhat twisted and with a conduplicate claw, smooth outside, finely pubescent within, white. Stamens 10, hypogynous, the filaments combined into a long

* *Melia*; the Greek μελία was the ash, but Linnæus employed the word as a generic name for the present species and *M. Azedarach*, in preference to the barbarous ones in use.

† *Azadirachta*, from the Persian name *Azād-dirakht.*

cylindrical erect tube somewhat dilated below and at the top, furrowed and smooth externally, hairy within, terminating above in 10 blunt, thick, recurved, irregularly trifid lobes; anthers small, erect, closely placed, introrse, oblong, 2-celled. Ovary 3-celled, with 2 ovules in each cell, style about the length of the staminal tube, stigma 5-lobed. Fruit an ovoid, bluntly pointed, smooth, dark purple drupe not an inch long, with a very scanty pulp and a hard bony endocarp. Seed solitary (the other ovules abortive), with a thick testa, embryo with foliaceous cotyledons in the axis of scanty endosperm.

Habitat.—The Nim or Neem tree is common throughout India, but is not wild in the north-west provinces, though much planted there as well as in other parts; it ranges as high as 5000 feet in Kumaon. It is found also in Burmah, Ceylon, Java, &c., either wild or cultivated for ornament. The flowers, which are very sweet-scented, especially at night, appear in March—May, and the fruit is ripe in July and August; the tree is never leafless, the old foliage persisting till after the young leaves have expanded.

This differs from the other species of *Melia* in the 1-celled fruit and perhaps in the structure of the embryo, and was considered to constitute a distinct genus by Jussieu.

The "Bead-tree" so commonly planted in the south of Europe and now found in every one of the warm countries of the globe is *Melia Azedarach*, Linn., the native country of which cannot be with certainty determined, but is probably China. It has bipinnate leaves, pale purple flowers, and the hard stone of the fruit is (usually) 5-celled.

Dr. Brandis considers that the specific name *Azadirachta* cannot be employed, as it is but another form of *Azedarach;* the words are, however, sufficiently different for ready distinction.

Roxburgh, Fl. Indica, ii, p. 394; Hiern, in Fl. Brit. India, i, p. 544; Brandis, Forest Flora, p. 67.

Official Parts and Names.—1. AZADIRACHTÆ CORTEX; the bark: 2. AZADIRACHTÆ FOLIA; the fresh leaves (I. P.). The bark is also known under the names of *Nim Bark* and *Margosa Bark;* and the leaves, as *Nim* and *Margosa leaves.* These drugs are not

official in the British Pharmacopœia; but the root-bark of an allied species of Melia, namely, Melia Azedarach, *L.*, is official in the Secondary List of the United States Pharmacopœia, and will be described after the Indian drugs.

1. Azadirachtæ Cortex.—*General Characters and Composition.*—Nim bark varies much in its characters according to the size and age of the tree from whence it has been derived. In the Pharmacopœia of India it is thus described :—"The bark from the trunk of a tree above three or four years of age is covered with a thick scaly epidermis, and varies in thickness from $\frac{1}{4}$ to $\frac{1}{2}$ an inch. That from the smaller branches is smooth, of a dull purplish colour, marked by longitudinal lines of ash-coloured epidermis, from one eighth to one twelfth of an inch apart. The inner layer of the bark, of a whitish colour in the fresh state, is powerfully bitter, far more so than the outer dark-coloured layer, which, however, possesses a greater amount of astringency." The dried bark is thus described in Pharmacographia :—"in coarse fibrous pieces about $\frac{1}{3}$ of an inch thick and 2 to 3 inches wide, slightly channelled; the suberous coat is rough and cracked, and of a greyish-rusty hue; the inner surface is of a bright buff and has a highly foliaceous structure." The inner layer is alone directed to be used in the official preparations of the Pharmacopœia of India. The dried bark has no odour, but a slightly astringent bitter taste.

According to the analysis of Cornish, made in India in 1856, this bark contains a *volatile oil, bitter resin, gum, starch, saccharine matter,* an *astringent substance* (*catechin*), and a bitter crystallizable principle named by him *margosine.* Margosine was found most abundantly in the inner bark, the external layers containing most astringent principle. This margosine of Cornish is supposed by Waring to be identical with the principle previously obtained by Piddington, and named by him *sulphate of azederine.* According to the more recent researches of Broughton, the bitter principle of Margosa bark is an *amorphous neutral resin.* This resin has a faint but agreeable smell; is only slightly soluble in water, but readily so in alcohol, ether, benzol, and boiling solutions of fixed alkalies.

Broughton also obtained a small quantity of a crystalline substance, which he states is certainly not the active principle of the bark, nor an alkaloid; but probably a fatty body.

Medical Properties and Uses.—Margosa or Nim bark is generally regarded in India as an antiperiodic, and astringent tonic. It has been employed with success both by natives and European practitioners in intermittent and other paroxysmal fevers as a substitute for cinchona bark; and more especially as an astringent tonic in general debility, and convalescence after febrile and inflammatory affections.

2. Azadirachtæ Folia.—*General Characters and Composition.*—The botanical characters of Nim leaves have been already described. In the Pharmacopœia of India they are directed to be used fresh; in which state they have an intensely bitter taste. The experiments of Broughton show that the leaves also contain a small amount of a bitter substance of a similar nature to that found in the bark, but far more soluble in water. It has very similar properties to the resin of which it is regarded as a hydrate. Broughton could find no peculiar alkaloid in the leaves.

Medical Properties and Uses.—The leaves are not generally used internally, but are employed as a local stimulant, chiefly in the form of the official poultice of the Pharmacopœia of India, and are said to produce a beneficial effect when applied to ulcers and in obstinate skin diseases. They are likewise stated to have a powerful effect in promoting the absorption of glandular tumours. The natives use the fresh green leaves to cover the bodies of patients suffering from smallpox. Dr. Pulney Andy, of Madras, has also recommended them as a valuable remedy in the premonitory and progressive stages of smallpox; and Dr. C. Macnamara has advocated the employment of the watery extract of the dried leaves in cases of leprosy.

3. Other Products of the Nim Tree.—The fruit yields by expression a fixed oil which has a strong bitter taste, and is in great repute amongst the natives as an external application in rheumatism, and also internally as an anthelmintic. It is likewise employed for burning and other purposes, and is said to be an

insecticide. Broughton found in it a small quantity of the same bitter substance as that occurring in the leaves. The roots are also reputed to have vermifuge properties. A variety of gum exudes from the stem; and by tapping the young trees a kind of toddy is obtained, which is regarded by the Hindoos as a stomachic.

Waring, Pharmacopœia of India, pp. 53 and 443; Pharmacographia, p. 136; Cornish, Indian Annals of Medical Science (1857), Calcutta, vol. iv, pp. 104 and 109; Ainslie, Mat. Med. of Hindostan, p. 123; Broughton, in Madras Monthly Journal of Med. Sci., and in Pharm. Jl., ser. 3, vol. iii, p. 992.

4. Other Official Species of Melia.—Azedarach; the bark of the root of Melia Azedarach, *L.* (U. S. P. *Secondary*). The tree yielding this bark is a native of China and India, and is also now widely distributed over the warmer parts of the globe, being cultivated in the Southern States of America, in Africa, and the south of Europe, &c. It is variously known as the Pride of India, Pride of China, Bead-tree, Holy-tree, &c.

General Characters and Composition.—Azedarach is generally employed in the recent state, when it is described as having a bitter nauseous taste; it yields its virtues to boiling water. By drying the bark loses much of its activity, hence it is rarely to be found in the shops; but in the Southern States, where it is commonly cultivated, it is much valued in some districts.

It does not appear to have been analysed.

Medical Properties and Uses.—Azedarach in ordinary doses acts as a cathartic and emetic, and in excessive doses as a narcotic, resembling in its effects in such cases, it is said, those produced by Spigelia. In the Southern States it is regarded as an efficient anthelmintic; it is also stated "to be useful in those infantile remittents which resemble verminose fevers without being dependent on the presence of worms." The decoction is the best form of administration.

U. S. Disp., by W. & B., p. 161; Wood, Therapeutics and Pharmacology, vol. ii, p. 869; Stillé, Therap. and Mat. Med., vol. ii, p. 624; Eberle, Therapeutics, p. 156; Pharmacopœia of India, p. 55.

DESCRIPTION OF PLATE.

Drawn from an Indian specimen collected by Wallich (no. 1251) in the British Museum; the fruit from a Ceylon specimen collected by Thwaites.

1. A twig with flower-panicles.
2. A flower.
3. The same, with the petals removed.
4. Staminal tube laid open and four anthers removed.
5. Vertical section of pistil.
6. Transverse section of ovary.
7. Fruit.
8. Transverse section of the same.

(2–6 enlarged.)

M & N Hanhart imp.

SUMMEA TERPSIFLORA J. Jacq.

N. Ord. MELIACEÆ.

Tribe *Swieteniceæ* (*Cedrelaceæ*, Lindl., Veg. Kingd.).

Genus Soymida,* *A. Juss.* B. & H., Gen., i, p. 338. There is but a single species.

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63. Soymida febrifuga, *A. Juss. in Mém. Mus.*, xix, *p.* 250 (1830).

Rohn, Rohan, Sohn (Bengal). *Soomi, Somida* (Telegu). *Red or Bastard Cedar.*

Syn.—Swietenia febrifuga, *Willd.* S. Soymida, *Duncan.* Cedrela febrifuga, *Roxb.*

Icon.—Steph. & Ch., t. 81; Jussieu in Mémoires du Museum, xix, t. 11; Roxb., Plants of Coromandel, t. 17; Beddome, Fl. Sylvat., t. 8.

Description.—A very large tree, 70—80 feet high, with a straight trunk and a dense, large, rounded head of numerous branches; bark of trunk very rough, brownish, warted, red within, coming off in large pieces; wood bright red. Leaves alternate, without stipules, on long stalks, pinnate, 12—18 inches long, with about 12 shortly stalked leaflets, either opposite in pairs or alternate, 2—4 inches long, the terminal ones smaller, ovate-oblong, obtuse, blunt at apex, often unequal at the base, entire, thick, glabrous, veined. Flowers rather small, shortly stalked, in small lateral cymes on the divaricate branches of the large paniculate axillary or terminal inflorescences, which are 8—12 inches long, panicle-branches smooth, bracts minute, acute. Sepals 5, small, orbicular, spreading, flat, imbricated. Petals 5, very much longer than the sepals, rounded, with a longish claw, spreading, concave, veined, greenish-white. Stamens 10, the filaments united for half their length into a fleshy, cup-shaped, hypogynous short tube, the upper half free, broad, very thick and fleshy, each terminating in two divaricate, pointed lobes; anthers placed between the lobes, introrse, short, 2-celled. Ovary ovoid, smooth, 5-celled, with numerous pen-

* *Soymida*, from the native Telegu name.

dulous ovules in each cell; style short, broad; stigma large, flat, on a level with the crown of stamens, 5-lobed. Fruit (not seen) a woody capsule, oblong-ovoid, about 1 inch long, 5-celled, dehiscing from the apex septifragally into 5 valves, each of which splits into two layers and also separates from the large, persistent, 5-angled axis. Seeds imbricated in two rows, pendulous from the top of the axis, compressed, margined, produced at either end into a wing, the upper the longer; embryo with foliaceous cotyledons two-eared at the base, radicle very short, superior; no endosperm.

Habitat.—This fine forest tree, nearly allied to the mahogany, is a native of Central and Southern India, having a somewhat restricted range in hilly districts, and not extending north of the parallel of 25° N. lat., but reaching Ceylon. It is nearly an evergreen, and produces its abundant but inconspicuous flowers in April and May; the capsule is nearly black when ripe. It has not been grown in English botanic gardens.

Brandis, Forest Flora, p. 71; Hook f., Fl. Brit. India, i, p. 567; Roxburgh, Fl. Ind., ii, p. 398; DC. Prod., i, p. 625; Lindl., Fl. Med., p. 155.

Official Part and Name.—Soymidæ Cortex; the bark (I. P.). It is not official in the British Pharmacopœia or the Pharmacopœia of the United States. But it was formerly official in both the Edinburgh and Dublin Pharmacopœias. It is commonly known as Rohun Bark.

General Characters and Composition.—Rohun Bark varies in appearance according to its age. The older bark is in compact, thick, fibrous pieces, which are of a red colour internally, and rough, and of a rusty grey or brown colour externally; without any distinctive odour, but with a bitter astringent taste. The bark obtained from the young tree is thus described in 'Pharmacographia:' "In straight or somewhat curved, half tubular quills, an inch or more in diameter, and about $\frac{1}{5}$ of an inch in thickness. Externally it is of a rusty grey or brown colour, with a smoothish surface exhibiting no considerable furrows or cracks, but nume-

rous small corky warts. These form little elliptic scars or rings brown in the centre, and but slightly raised from the surface. The inner side and edges of the quills are of a bright reddish brown. The liber has a fibrous fracture, that of the outer part of the bark being rather corky or foliaceous. The whole bark when comminuted is of a rusty colour, becoming reddish by exposure to air and moisture."

Rohun bark contains a large amount of *tannic acid*, and a *bitter principle*, which has been described by Broughton as a resinous substance, nearly colourless, uncrystallizable, of a very bitter taste, sparingly soluble in water, but more soluble in alcohol or ether, and having no tendency to unite with acids or bases. It is to these two substances that Rohun bark owes its medicinal properties.

Substitution.—In the Bengal bazaars, as is noticed in our article on *Strychnos Nux-vomica*, the bark of that plant is also known under the same native name of *Rohun*, and this has led to its occasional substitution for Soymida bark. The substitution of such a poisonous bark as that of nux-vomica for it might lead to very serious consequences, and hence in the Pharmacopœia of India the following test is given for Soymida bark: Nitric acid applied to its inner surface does not cause a bright red stain.

Medical Properties and Uses.—Rohun bark is said to possess astringent, tonic, and antiperiodic properties. It has been recommended by Dr. Roxburgh, Dr. Breton, Dr. Duncan, and others, as a substitute for Cinchona bark, but Sir W. O'Shaughnessy considers it to be of very doubtful efficacy. It is stated by Waring to have been used successfully in India, in intermittent fevers and general debility, in the advanced stages of dysentery, in diarrhœa, and in other cases where astringents are required. In the form of the decoction it is also regarded as a good substitute for that of oak bark, and well adapted for use as a gargle in relaxed sore throat, and for vaginal injections and enemas in those cases where astringent local applications are required.

Steph. & Ch., Med. Bot., by Burnett, vol. ii, pl. 81; Pharmacographia, p. 137; Pharmacopœia of India, pp. 55 and 444;

Roxb., Fl. Ind., vol. ii, p. 398; Breton. in Med. Chir. Trans., vol. xi, p. 324; O'Shaughnessy, Bengal Disp., p. 249; Beddome, Flora Sylvatica, Madras, part i (1869), p. 8.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected in India by Dr. Roxburgh.

1. A leaf and panicle of flowers.
2. Vertical section of a flower.
3. Calyx.
4. Two petals.
5. Inner, and—6. Outer view of part of staminal whorl.
7. Pistil.
8. Transverse section of ovary.

(2—8 enlarged.)

D. Blair ad nat. del. et lith.

J. T. Hannart imp.

RHAMNUS CATHARTICUS. I.

N. Ord. RHAMNACEÆ. Lindl., Veg. Kingd., p. 581; Le Maout and Dec., p. 346; Baill., Hist. Pl., vi.

Tribe *Rhamneæ*.

Genus Rhamnus,* *Linn.* (in part). B. & H., Gen., i, p. 377; Baill., l. c., p. 51. Species about 60, generally distributed; rare in the tropics.

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64. Rhamnus catharticus, *Linn., Sp. Pl. ed.* 1, *p.* 193 (1753).

Buckthorn.

Syn.—Cervispina cathartica, *Moench.*

Figures.—Woodv., t. 210; Steph. & Ch., t. 119; Hayne, v, t. 43; Nees, t. 360; Berg & Sch., t. 16 f; Syme, E. B., ii, t. 318.

Description.—A dense, spreading, much-branched bush or small tree, not reaching more than about 12 feet high, the smaller branches often ending in a sharp spine; bark rather smooth, dark grey. Leaves variously arranged: fasciculate on the short twigs of the previous year, alternate or sub-opposite on the young green shoots of the current year; dingy-green, smooth, petioles about half as long as the blade; stipules small, linear, deciduous; blade 1—1½ inches long, broadly oval, rounded or slightly attenuated at the apex, finely serrulate; veins very prominent beneath, the lateral ones few, arched in a direction parallel with the margin. Flowers dioecious, very small, yellowish-green, stalked, in small sessile umbels or solitary from the axils of the fascicles of leaves on the previous year's twigs. Male flowers: calyx-tube campanulate; limb in 4 ovate-lanceolate segments; petals 4, linear-spathulate, much smaller than the calyx-segments with which they alternate; stamens 4, immediately opposite the petals, and with them inserted on the upper margin of the calyx-tube (disk); pistil quite rudimentary. Female flowers: calyx as in the male, but tube wider to accommodate the ovary; petals much smaller than in the male, and stamens rudimentary; ovary superior, enclosed in the

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* Ῥάμνος, the classical name, originally applied to the spiny *Paliurus.*

calyx-tube but free from it, 4-celled, with one erect ovule in each cell; style cleft about half-way down into 4 blunt branches. Fruit fleshy, round, about the size of a pea, umbilicated at the apex, surrounded at the base by a circular persistent portion of the calyx-tube, shining, at first green, then black; skin thin; pulp scanty, containing 4 hard, indehiscent, dark-brown stones (pyrenes), which are obovoid, grooved on their outer surface, where the walls are folded inwards, hollow in the centre, angled at the inner edge, where they meet in the middle of the fruit. Seeds one in each stone, furrowed deeply on back, shallowly on front, curved from side to side in a revolute manner (so as to make a horseshoe on section) round the central cavity of the stone, the convexity inwards; embryo in the axis of scanty endosperm, and similarly curved, cotyledons large, raphe running to the top of the seed in the dorsal furrow.

Habitat.—In England this shrub is chiefly, though not exclusively, found in chalky districts, where it occurs in thickets and small woods. It is not unfrequent in the south, but becomes rare northwards, and is not native in Scotland. In Europe it is found in all parts except the extreme north, and extends far eastwards into Siberia; it has also been observed in Algeria, and is cultivated in the United States. The structure of the fruit is remarkable and quite unlike that of a true berry, to which its outward appearance is so similar; one or two of the stones are frequently abortive.

Syme, E. Bot., ii, p. 226; Hook. f., Stud. Fl., p. 82; Wats., Comp. Cyb. Br., p. 136; Gren. and Godr., Fl. France, i, p. 335; Lindl. Fl. Med., p. 167.

Official Part and Name.—Rhamni Succus. The recently expressed juice of the ripe berries (B. P.). The recently expressed juice of the ripe berries (*Rhamni Succus, Buckthorn juice* (I. P.). Not official in the Pharmacopœia of the United States.

Collection.—Buckthorn fruits are plentiful in certain parts of Hertfordshire, Oxfordshire, Buckinghamshire, Wiltshire, and some other counties in England, and from these parts

our supplies are chiefly obtained; but the collectors commonly prefer to supply the juice expressed by themselves rather than the ripe fruit, and as this juice is generally, as shown by Umney, largely diluted with water, the supply of the ripe fruit ought to be insisted on.

General Characters and Composition of the Juice.—The fresh juice is green, and has a very unpleasant odour, and a bitterish, somewhat acrid, disagreeable taste. Its specific gravity, according to Umney, should be 1·070 to 1·080. By keeping, its colour gradually changes to red, and its specific gravity, from a deposition of solid matter, is reduced to 1·035.

Buckthorn fruit and juice have been repeatedly analysed, and several colouring principles have been obtained from them and similar parts of other species of *Rhamnus*, but at present we have no satisfactory evidence of the source of their active purgative properties, although Winckler believes that this resides in a principle which he has termed *cathartin*. A yellow crystalline principle has also been indicated by Fleury, who named it *rhamnine*, and more recently this has been examined by Lefort and other chemists, but with very conflicting results.

Medical Properties and Uses.—Buckthorn juice is a powerful hydragogue cathartic, but as its action is frequently attended with severe griping, nausea, and thirst, it is but very little used at the present day, except as a domestic remedy and in veterinary practice. It is generally prescribed in the form of syrup for children.

Formerly buckthorn juice was frequently employed in cases where an active cathartic was required, as in gout and rheumatism, obstinate constipation, and dropsical affections. Lately, the bark of *Rhamnus Frangula*, Alder Buckthorn, which has been long employed in Germany, has been highly recommended for use in this country as being a valuable cathartic without causing any of the distressing effects so frequently found to accompany the action of buckthorn juice. (See *Rhamnus Frangula*.)

The pigment, so well known as *sap-green*, the *vert de vessie* of

the French, is prepared by evaporating to dryness fresh buckthorn juice which has been previously mixed with lime.

Pharmacographia, p. 139; Per. Mat. Med., vol. ii, part ii, p. 388; U. S. Disp., by W. and B., p. 728; Garr. Mat. Med., 4 ed., p. 229; Bentl., Man. Bot., p. 490; Ph. Jl., July 11, 1874, p. 21.

DESCRIPTION OF PLATE.

Drawn from a specimen in the garden of the Apothecaries' Company at Chelsea, assisted by a wild example from Box Hill, Surrey.

1. Branch with clusters of male flowers.
2. A male flower cut vertically.
3. Petal.
4. Stamen.
5. A female flower cut vertically.
6. Transverse section of ovary.
7. A branch with ripe fruit.
8. Base of fruit showing persistent base of calyx-tube.
9. Transverse section of fruit.
10, 11. Back of a single stone.
12. Front view of same.
13. Transverse section of same.
14. Back view of a seed.

(2—6 and 8—13 enlarged.)

P.J. Blume ad nat. del. et lith.

N. & Ph. Henhart imp.

RHAMNUS FRANGULA Linn.

N. Ord. RHAMNACEÆ.

Tribe *Rhamneæ*.

Genus **Rhamnus**, *Linn.*

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65. Rhamnus Frangula,* *Linn., Sp. Plant, ed.* 1, *p.* 193 (1753).

Black Alder. Berry-bearing Alder. Alder Buckthorn.

Syn.—Frangula vulgaris, *Reichenbach.*

Figures.—Hayne, v, t. 44; Nees, t. 359; Berg & Sch., t. 19 f; Syme, E. Bot., ii, t. 319; Sturm, Deutschl. Fl., heft 95, t. 3.

Description.—A slender, somewhat straggling bush about 6—12 feet in height, with a smooth purplish-grey bark with white lenticels, branches never terminating in spines, extremities of young branches, buds and petioles with a short fulvous down. Leaves alternate with very small, triangular-linear, deciduous stipules, rather long-stalked, blade $1\frac{1}{2}$—$2\frac{1}{4}$ inches long, oval or slightly obovate-oval, rounded or abrupt at the base, usually somewhat attenuated at the apex, quite entire, rather flaccid and undulated, smooth, bright green, veins very sharp and prominent beneath, the lateral ones, 7—10 on each side, slightly curved and parallel. Flowers bisexual, very small, on slender drooping stalks in small clusters of 2—5 in the axils of the leaves. Calyx with a bell-shaped tube, puberulous outside, and 5 ovate-triangular segments, pale-green, tinged with whitish-pink. Petals 5, inserted above the calyx-tube, not so large as the calyx-segments with which they alternate, margins involute. Stamens 5, inserted opposite and immediately in front of the petals, by which they are partially enfolded, filaments very short, anthers rounded. Ovary enclosed in the calyx-tube, depressed, 3-lobed, 3-celled; style very short, thick, stigma faintly 3-lobed. Fruit berry-like, when ripe about the same size as that of *R. catharticus*, and like it surrounded at the base by the persistent flattened circular piece

* *Frangula*, probably from *frango*, to break, the mediæval name for this bush; from its brittle stems?

of the calyx-tube, green when young, passing through white, pale yellow, and pink to purplish-black when ripe, on somewhat deflexed stalks over ¼ inch long; pericarp thin, pulp thin, watery; pyrenes 2 (rarely 3), rather unequal, rounded in outline, compressed, flattened on inner, convex on outer surface, bony, smooth, yellow, the inner surface marked down the whole centre by a faint line. Seed solitary in the pyrene and similar to it in form, testa thin and yellow, closely invested by the pyrene, except at the base which protrudes beyond it and is white, hard, rounded, and bony, somewhat two-lipped; embryo bright green, cotyledons large, plane, pressed together, plumule minute, radicle small, projecting, pointing to one side of the hilum; endosperm solid, scanty, at the sides of the cotyledons.

Habitat.—This rather pretty shrub is a native of this country in woods, bushy places, and hedges, where it is by no means uncommon, especially on damp or clay soils; becoming, however, very rare in Scotland. It is found throughout Europe, extending also into Siberia, the Caucasus, and the Mediterranean coast of Africa. It flowers in early summer, and the fruit is ripe in July.

The very different structure of the pyrenes in this plant from that in *R. catharticus* (in spite of the external similarity of their fruits), taken along with the flat cotyledons and the hermaphrodite flowers with a quinary symmetry, certainly afford strong grounds for retaining the old genus *Frangula* (as has been done by Brongniart, A. Gray, and J. J. Bennett) apart from *Rhamnus*, but the authors of the 'Genera Plantarum' give reasons against that step, and we have thought it best in this case to follow the generally received nomenclature.

Syme, E. Bot., ii, p. 228; Hook. f., Stud. Fl., p. 83; Wats., Comp. Cyb. Br., p. 136; Gren. & Godr., Fl. France, i, p. 338; Ledebour, Fl. Ross., i, p. 503; Boiss., Fl. Orient., ii, p. 21; Lindl., Fl. Med., p. 167.

Part Used and Name.—Rhamni Frangulæ Cortex; the bark of the young trunks and of the larger branches. It is not official in the British Pharmacopœia, the Pharmacopœia of India, or the

Pharmacopœia of the United States. But it is official in the German Pharmacopœia and some other European Pharmacopœias.

Collection.—The bark should be obtained in the spring from the young trunks and large branches, and carefully dried; that obtained from the old trunks should not be collected, as it is altogether different in taste and other characters from the younger bark.

General Characters and Composition.—The official Cortex Rhamni Frangulæ of the German and other European Pharmacopœias, is also commonly known as Black Alder, and Alder Buckthorn bark. It is in small quills, averaging about $\frac{1}{2}$ a line in thickness. It has a grey, brownish-grey, or blackish-brown colour externally, and is marked by whitish, warty, transversely lengthened protuberances. Internally it is smooth and brownish-yellow. It has a compact, somewhat fibrous texture; and is without any marked odour; but with a pleasant, sweetish taste. Baildon, of Edinburgh, who has recently recommended this bark for medicinal use in Great Britain, says that the bark in small quills should alone be used, as that "taken from the thick part of the trunk is altogether different, and the decoction made from it is nauseous to the taste, whereas that made from the quilled bark is singularly pleasant, with a slight almond or prussic acid flavour."

Black alder bark has been analysed by Gerber, Binswanger, Buchner, and other chemists. The principal constituents appear to be *Rhamnoxanthin* or *Frangulin;* two *resins,* one soluble in ether, and the other soluble in alcohol, but insoluble in ether; a *bitter matter* also of a resinous nature; a little *tannic acid;* and *extractive matter.* Rhamnoxanthin is a yellow crystallisable colouring principle. It is accompanied, according to Casselmann, by an amorphous resinous yellow substance, and is most abundant in the bark of the older branches, that of the younger branches containing a larger proportion of the resinous constituent. We have no positive evidence of the constituent in which resides the purgative property of the bark, but Binswanger attributed it to the bitter matter of a resinous nature. This bitter matter of

Binswanger is probably the same as the amorphous yellow resinous substance of Casselmann, and the existence of this principle and rhamnoxanthin in varying proportions in the bark of the older and younger branches is probably the cause of the difference of taste, &c., in these two barks as noticed above; and moreover, as the younger bark is generally regarded as the more active, we have further evidence that the amorphous resinous yellow substance or bitter matter? is the purgative principle.

Medical Properties and Uses.—In Germany, Holland, and some other parts of Europe, black alder bark has long been employed as a purgative, and it has lately been highly recommended for the same purpose in Great Britain. Its action is said to be as mild as that of castor oil, and as certain as that of senna; and from its comparatively pleasant taste to that of senna and other purgatives to be especially adapted for children. It is also said to be extremely valuable in counteracting habitual constipation. The best forms of administration are stated to be the fluid extract and decoction.

Watts' Dict. Chem., vol. ii, p. 706, and vol. v, p. 100; Royle's Mat. Med., by J. Harley, p. 670; Pharm. Journ., vol. ii, 1st ser., p. 721, and vol. ix, p. 537; Buchner, Journ. de Pharm., 3rd ser., vol. xxiv, p. 293; Phipson, Compt. rendus, vol. xlvii, p. 153; Casselmann, Ann. Ch. Pharm., vol. civ, p. 77; Buchner, Jahresber., 1853, p. 536; Baildon, in Pharm. Journ., vol. ii, 3rd ser., p. 152, and vol. iv, p. 889; Ince, in Chemist and Druggist, June, 1874; Baildon, in Year Book of Pharmacy, 1874, p. 544; Umney, in Pharm. Journ., vol. v, 3rd ser., p. 21.

DESCRIPTION OF PLATE.

Drawn from specimens collected in the Isle of Wight by Mr. F. Stratton, and near Sevenoaks, Kent. 1. A branch in flower. 2. A flower. 3. Vertical section of the same. 4. A petal and stamen. 5. Side view of a stamen. 6. Pistil. 7. Section of ovary. 8. A branch with fruit. 9. Vertical, and—10. Transverse section of fruit. 11. Base of fruit. 12 and 13. Inside, and—14. Outside view of a pyrene. 15 and 16. Vertical, and—17. Transverse section of the same. (2–7, 9–11, 13–17 enlarged.)

VITIS VINIFERA, *Linn.*

M & N. Hanhart imp

N. Ord. AMPELIDEÆ. Lindl., Veg. Kingd., p. 439; Le Maout & Dec., p. 349.

Genus Vitis,* *Linn.* B. &. H., Gen., i, p. 387. Including *Cissus*, a very large genus of about 250 species, natives of both Worlds, and chiefly tropical and subtropical.

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66. Vitis vinifera, *Linn., Sp. Plant., ed.* 1, *p.* 202 (1753).

Vine. Grape Vine.

Figures.—Woodville, t. 57; Hayne, x, t. 40; Steph. & Ch., t. 140; Nees, tt. 369, 370; Berg & Schm., t. 18 a; Berg, Characterist., t. 78, fig. 563; Flora Græca, t. 242; Nouveau Duhamel, vii, tt. 61—72.

Description.—A shrub, or more rarely a tree, with a thick trunk and numerous long, tortuous, irregular straggling branches, somewhat thickened at the nodes, bark brown, furrowed, coming away from the older branches in shreds, on the young branches smooth, striate, yellow brown. Leaves alternate, on long spreading smooth petioles, stipules small, nearly lanceolate, thin, soon falling, blade 2—4 inches or more long, roundish in general outline, cordate at the base, palmately veined, and more or less deeply divided into 5 acute lobes, with the margin irregularly cut into large acute teeth, glabrous on both sides or somewhat pubescent beneath especially when young, bright green often tinged with red, thin; tendrils (abortive inflorescences) coming off opposite the leaves, horizontally spreading, long, smooth, slightly branched, tapering. Flowers very small, on rather long, slender, smooth, pale green pedicels greatly dilated at the summit, several of which (10—20) compose small umbellato-racemose stalked clusters, which are themselves arranged irregularly to form oblong-ovoid, blunt, somewhat tapering, rather dense, branched panicles about 2—4 inches long, supported on smooth peduncles coming off, like the tendrils, opposite the leaves, and often cirrhiferous in the lower portion; buds obovate, smooth, bright green; bractlets lanceolate acute, pale green, at the base of the clusters. Calyx of 5 minute

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* *Vitis*, the Latin name, of Celtic origin; in Greek the vine is ἄμπελος.

teeth at the margin of the dilated receptacle. Petals 5 (rarely 4), valvate, remaining united by their apices, but separating at once from the receptacle on the expansion of the flowers and coming off in one star-like piece, smooth, green. Stamens 5 (rarely 4), hypogynous, opposite the petals, often with 5 small fleshy staminodes alternating with them, filaments slender, erect-spreading, straight, white, anthers squarish, introrse afterwards versatile. Ovary flask-shaped, shorter than the stamens, 2-celled, with two erect ovules in each cell; style very short, stigma capitate. Fruit an ovoid or nearly globular berry, varying from $\frac{1}{2}$ to 1 inch in diameter, pendulous, strongly attached to the enlarged and hardened pedicel and receptacle the upper part of which is set with small raised orange-coloured warty prominences, smooth and polished, translucent, marked at the summit with the minute scar of the style; pericarp thin, tough, green, yellow, or deep blood red, covered when ripe with a scanty blueish-white "bloom," completely filled with a solid, gelatinous, very juicy greenish pulp, which is traversed up the centre by the vessels of the dissepiment, and contains on either side 1 or 2 erect seeds. Seeds $\frac{1}{4}$—$\frac{3}{4}$ inch long, somewhat pear-shaped, notched at the rounded summit, smooth, hard, pinkish grey, flattened on the ventral surface, which is marked along the centre by the raphe which passes over the notch on the summit and terminates in the large depressed chalaza on the dorsal surface; testa soft, inner coat bony, red, the ventral surface with two deep longitudinal furrows, endosperm filling the seed, embryo small in the base of the central portion of the endosperm which projects between the furrows on the ventral surface, straight, slender, radicle inferior.

Habitat.—The vine has been cultivated from the earliest times of which we have any record, and it appears to be truly wild in the countries to which such records refer. In Persia, the Caucasus, many parts of Asia Minor, Macedonia, Greece and Italy, the wild vine is a frequent climber over other trees, especially in the neighbourhood of streams; it is also thought to be probably native in the N.W. Himalayas. It is very closely allied to *V. latifolia*, Roxb., *V. parvifolia*, Roxb., and *V. lanata*, Roxb., all Indian

species, and has been suggested by Regel to be originally a hybrid between the two last, which are by him considered to be identical with two frequent North American vines, *V. vulpina*, Linn., and *V. Labrusca*, Linn., the Muscadine and Fox grapes. These are often themselves cultivated in the United States, but the fruit is very inferior.

In the wild plant the leaves are less deeply lobed. The flowers appear in June, and have a pleasant, slightly musky odour; the elongation and development of the stamens forces up and pushes off the coherent petals, and the flowers when expanded seem to be apetalous; the tendrils are obviously abortive inflorescences.

The cultivation of the vine in the open air on a large scale is confined to a comparatively narrow zone of the warm temperate region. In Europe the northern limit of vineyards varies from about 47° 30′ in Bretagne, to 50° 45′ on the Rhine, and 51° 55′ in Silesia. In countries with a cooler summer grapes will often ripen, and in the middle ages vineyards were frequent in England, but as a crop they would be here uncertain and less profitable than others. In tropical countries fruit is scarcely produced.

Out of Europe the vine is grown in every country with a suitable climate, *e.g.* Australia, the Cape, California, and other parts of N. America. The varieties of the grape vine are infinite; a large number were recognised by the classical writers on plants. Pliny has no less than eighty. Reference must be made to special treatises for accounts of these, especially to the Nouveau Duhamel, where ninety-two varieties are described. The small stoneless fruits known as currants are the produce of a variety grown chiefly in the Greek islands (var. *corinthiaca* or *apyrena*); the raisins called "Sultanas" also have the seeds undeveloped. The result is said to be due to the cup of the united petals adhering to the stigma and preventing fertilization.

Ledebour, Fl. Rossica, i, p. 458; Gren. & Godr., Fl. France, i, p. 323; Bertolini, Fl. Ital., ii, p. 673; Boiss., Fl. Orient., i, p. 955; Brandis, Forest Fl. India, p. 98; DC. Géogr. Bot., p. 872; Nouv. Duhamel, vii, p. 211; Lindl., Fl. Med., p. 65; Odart, Ampélographie (1845).

Official Part and Names.—Uvæ; the ripe fruit, dried in the sun or with artificial heat (B. P.). The ripe fruit, dried in the sun or with artificial heat (*Raisins*) (I. P.). Uva Passa; the dried fruit (U. S. P.). The raisins imported from Spain are alone official in the British Pharmacopœia. Before being dried the fruits are known as Grapes; these were formerly official.

Preparation.—The modes of drying grapes are commonly stated to be as follows:—1. The separate fruits being firmly attached to their stalks, as well as their common stalk or rachis to the branch, the bunches do not fall as the fruit ripens, but if allowed to remain the grapes gradually wither and dry on the vine by the heat of the sun; hence such dried grapes are called *raisins of the sun.* In order to facilitate their drying, the bunches are dipped in boiling water or in an alkaline lye of wood ashes; or their stalks are twisted or partially severed from the branches. 2. In other cases, the grapes are picked when ripe, then steeped for a short time in boiling water to which an alkaline lye has been added. They are then dried by exposure to the sun; or partially by the sun, and subsequently by artificial heat. Muscatel raisins are said to be prepared by the first method; and Valencia raisins by the second mode. Those dried by the first method are most esteemed.

The above-described modes of drying are not, however, in accordance with information furnished to Dr. Wood, of the United States, when travelling in the South-east of Spain, in the spring of 1861. Dr. Wood says that he made frequent inquiries at Malaga and Valencia, and found no one had heard of the plan of partially cutting the stalks of the bunches, and then allowing the grapes to dry on the plant; but that near Malaga, where the fine Muscatel rasins are prepared, the following is the method adopted:—"The grapes are ripe in August, when the bunches are cut off, and carefully dried in the sun upon a hard level earthen floor, prepared for the purpose, which is protected by a shed when it rains. After one side of the bunch has become dry, the other is carefully turned to the sun. When dried they are generally packed in wooden boxes, each containing about twenty-five pounds. The most valuable, called

the *bloom raisins*, from the preservation of the bloom unbroken on the surface, are packed in paper boxes, and sent, as the author was told, exclusively to the London market." Dr. Wood was also informed that the grape from which the *Valencia raisin* was derived was thicker skinned than that yielding the *Muscatel raisin*, and did not therefore dry well without previous preparation. "Hence, as soon as picked, they are dipped in a lye made from wood ashes, immediately removed, and then dried. The alkali causes the skin to crack in minute fissures, and thus facilitates drying."

Raisins are exported in enormous quantities from Spain and Asiatic Turkey. The variety of raisins known as *Corinthian raisins* or *Currants* are, however, derived from the Ionian Islands.

General Characters and Varieties.—Raisins are more or less shrivelled in appearance, compressed, smooth, free from sugary or saline incrustation, agreeably fragrant, and with a soft, very sweet pulp. There are several varieties distinguished in commerce. The finest, which are imported from Malaga, are termed *Muscatel Raisins*, a name derived from the variety of grape from which they are obtained. These are in entire bunches, and as already noticed, are carefully dried and packed for the market in boxes; they are used for dessert. *Valencia raisins* are those which are commonly employed in pharmacy; they are also largely used for culinary purposes. In this variety the raisins have been removed from their stalks; the name is derived from their place of growth in Spain. The variety known as *Sultanas* or *Sultanas Raisins* is obtained from Smyrna. Like the Valencia raisins, they have been separated from their stalks; they have no seeds, and are therefore said to be stoneless; they are principally used for culinary purposes. The only other variety that we need notice is that known as *Corinthian Raisins* or *Currants*. These are obtained from a very small variety of grape distinguished as the *Corinthian grape*. In the old Pharmacopœias they were distinguished by the name of *Uvæ passæ minores*. Their ordinary name is derived from the City of Corinth, in the neighbourhood of which they were formerly cultivated;

the term Currants is a corruption of Corinth. They are now chiefly procured, and in enormous quantities, packed in barrels, from Zante, Cephalonia, and the other Ionian Islands, and are used for culinary purposes. In this variety, the raisins, which are separated from their stalks, are very small, stoneless, of a blueish-black colour, fatty appearance, somewhat vinous odour, and a sweetish, feebly acidulous taste.

Composition of Grapes and Raisins.—When in an unripe state the juice of grapes, which is called *verjuice*, has a very harsh, acid taste; this is especially due to the presence of *malic* and *tartaric acids*, and to *acid tartrate of potash* or *cream of tartar*. When quite ripe grapes lose to a great extent their acid taste, and acquire in addition a delicious sweet flavour; their principal constituents are then *grape sugar* or *glucose*, and *acid tartrate of potash*. The expressed juice of the grape is called *must*. It yields by fermentation the various kinds of Wine, Brandy, Cognac or Spirit of French Wine, and Wine Vinegar; and from the *tartar* or *argol* which is deposited from it in the process of fermentation, which is an impure acid tartrate of potash, the official acid tartrate of potash is obtained, which is also the source of the official tartaric acid. *Grape sugar* is less sweet than cane sugar, less soluble in cold water, and much less so in alcohol, and forms a syrup of less consistence.

The *pulp* of dried grapes or raisins also abounds in *glucose* and *acid tartrate of potash*, so that in old raisins they may be found in separate crystallized masses in its substance. It also contains *gum* and *malic acid*. The *seeds* also yield from 15 to 18 per cent. of a *bland fixed oil*, and from 5 to 6 per cent. of *tannic acid*. The latter substance is likewise a constituent of the skin, together with colouring matters.

Medical Properties and Uses.—Raisins are demulcent and slightly refrigerant. They are never used in medicine for their therapeutic properties, but only as a flavouring agent.

The principal use of raisins is at dessert, and for culinary purposes.

Grapes are refrigerant, and, when taken freely, diuretic and

laxative. They allay thirst, and diminish febrile heat, and hence prove useful in febrile and inflammatory complaints. A course of grapes, the *grape cure*, is held in great esteem in Switzerland and some other parts of the Continent, as a remedy in pulmonary diseases and other affections.

Grapes form a wholesome and most agreeable dessert fruit; but when so used, as the seeds and skin are indigestible, these should be rejected. The juice of the unripe fruit was formerly employed in medicine; and was also much esteemed by the ancients for making a refreshing drink when diluted with water. It is still employed for making sherbets and syrups.

The leaves and tendrils of the grape vine possess astringent properties, and were formerly employed in diarrhœa and other affections where such qualities are desired.

Numbers vi, 3; 1 Sam. xxv, 18, xxx, 12; 2 Sam. xvi, 1; 1 Chron. xii, 40.

Per. Mat. Med., vol. ii, pt. 2, p. 419; Per. Mat. Med., by B. & R., p. 898; Pharmacographia, p. 141; U. S. Disp., by W. & B., p. 914; Royle, Mat Med., by J. Harley, p. 728; Watts, Dict. Chem., vol. ii, p. 628.

DESCRIPTION OF PLATE.

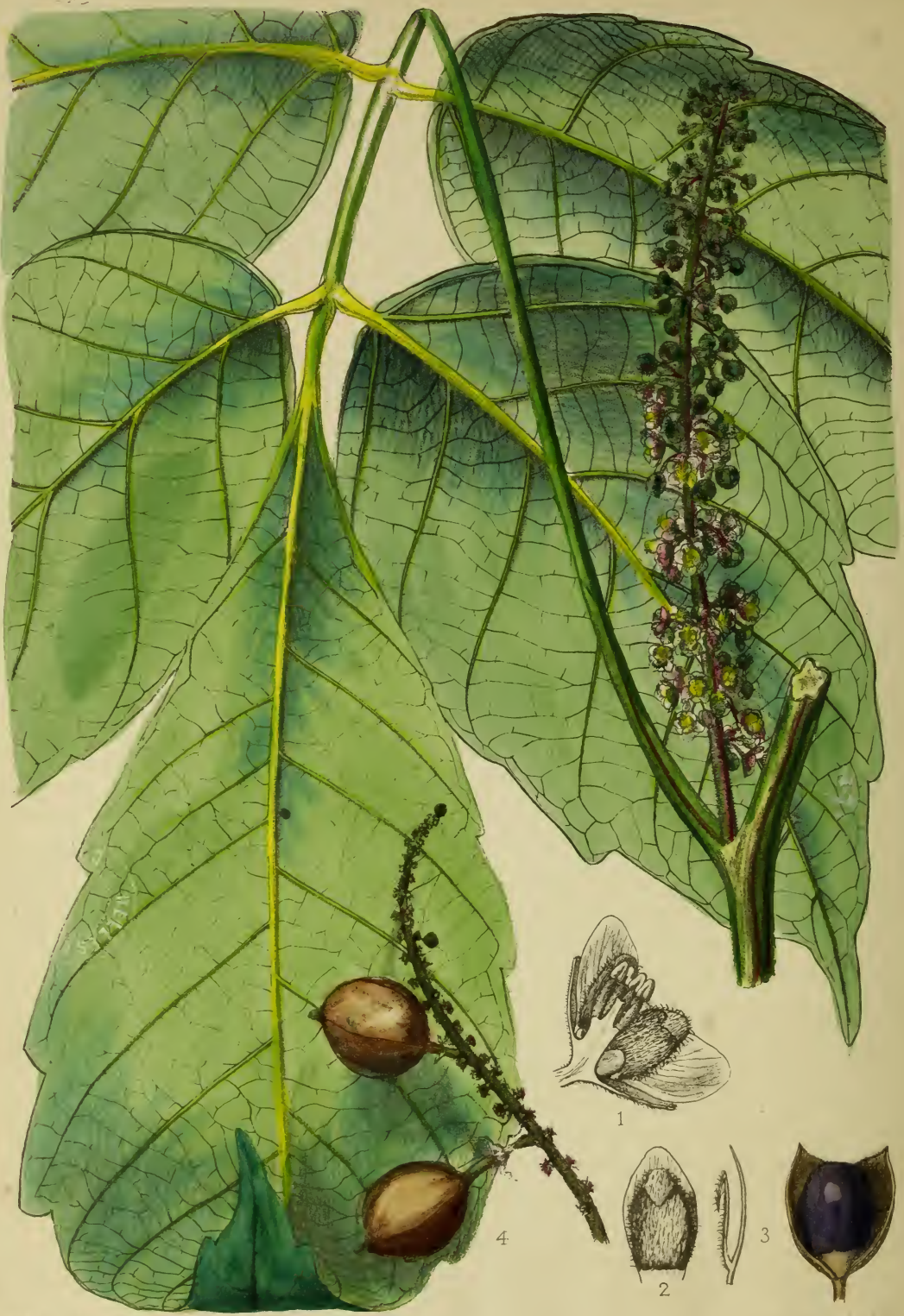
Drawn from a specimen grown at Chelsea.

1. Part of a branch with leaves and inflorescence.
2. A bud.
3. The same opening.
4. Flower after the fall of the petals.
5. Transverse section of ovary.
6. Bunch of ripe fruit.
7. Vertical section of a fruit.

8, 9. Dorsal; and—10. Ventral view of a seed.

11. Vertical; and—12. Transverse section of the same.

(2-5, 9-12 enlarged.)



PAULLINIA SORBILIS, *Mart.*

N. Ord. SAPINDACEÆ. Lindl., Veg. K., p. 382; Le Maout & Dec., p. 351; Baill., Hist., pl. v.

Tribe *Sapindeæ*.

Genus Paullinia, *Linn.** B. & H., Gen. i, p. 394; Baill., l. c., p. 516. Species over 80, natives of tropical America.

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67. Paullinia sorbilis,† *Martius* in *Spix & Mart. Reise in Brasil.*, iii, *p.* 1098 (1831).

Guarana-üva. Guarana.

Figures.—Schnitzlein, Iconographia, iv, t. 230, fig. 1 (from an unpublished figure of Martius); Baill., Hist. Pl., v, fig. 382, 3 (seed).

Description.—A woody climber (?), with an erect angular smooth stem. Leaves alternate, on long stalks, pinnate, with two pairs of leaflets and a terminal one, stipulate, petioles angular, glabrous, leaflets oblong-oval, 5 or 6 inches long by $2\frac{1}{2}$–3 inches broad, rather coriaceous, shortly stalked, the lateral ones rounded at the base, the terminal one tapering, all suddenly contracted into a shortly attenuated blunt point, the margin distantly, coarsely, and irregularly sinuate-dentate, smooth on both surfaces, rather strongly veined beneath. Inflorescence in erect, spicate, narrow panicles, 4 inches or more in length, from the axils of the leaves, pubescent, the flowers shortly stalked in small clusters, laxly arranged on the thick rachis, small. Sepals 5 (or 4) rounded, concave, imbricate. Petals 4, alternate with the sepals, ovate-spathulate, each with a large appendage attached to the upper surface near the base, pubescent on the front, and doubled over in the form of a claw at the apex. Stamens and pistil elevated on the summit of a wide column (gynophore), which projects into the upper part of the flower; in front of this, in the lower part of the flower, are two large, oval, compressed glands, and behind it two much smaller ones. Stamens 8, inserted on

* Named in commemoration of Christ. Fred. Paullini, a German medico-botanical writer, who died in 1712.

† *sorbilis*, potable, from its use as a drink.

the top of the gynophore round the base of the ovary; filaments thick, tapering, hairy, anthers attached by their back, bluntly pointed at apex, wide and rounded below. Ovary cylindrical, thick, short, 3-celled, ovules one in each cell, style none; stigma sessile on the ovary, 3-lobed. Fruit about the size of a grape, ovoid or pyriform, on a stalk about half its length (the gynophore), and with a short strong beak, glabrous, marked with six longitudinal ribs; pericarp thin, tough, strongly hairy within, 3-valved. Seed usually solitary (rarely 2 or 3), not quite filling the fruit, attached to the base, about the size of a small hazel-nut, roundish, usually slightly pointed at the apex, shining, purplish-brown, surrounded at the flattened base by a tough membranous white arillus; testa thin, brittle; embryo without endosperm, cotyledons thick and firm, unequal, large.

Habitat.—The Guarana plant grows in the northern and western portions of Brazil. Its seeds ripen in October and November; they have just the appearance of horse-chestnuts in miniature. The flowers of many species of this genus are imperfectly bisexual, and this is probably the case with the one now under notice; in the few flowers we examined of the limited material at our disposal we were unable to detect the ovules, the ovaries being apparently abortive.

Martius, Materia Medica Brasil. (1843), p. 59; Bentham, in Hook., Journ. Bot. and Kew Gardens Misc., iii (1851), p. 194.

Part Used and Name.—Not official in either the British, Indian, or United States Pharmacopœia. GAURANA.—This name, which is derived from a tribe of aborigines called Guarinis, is given to the seeds, which are used in Brazil in the preparation of a beverage and as a medicine. Guarana has been also introduced into Europe as a remedial agent.

Preparation.—The seeds are prepared for use as follows:—They are first dried and deprived of their aril, and then powdered in a mortar, or in some other way. The powder is afterwards mixed with a little water and kneaded into a kind of dough; this is then made into cylindrical or globular masses, which are

finally dried and hardened in the sun, or by the smoke of a fire. These rolls or masses are termed by the Indians *Pao de Guarana*, literally sticks of Guarana, and they are also known under the names of Guarana bread, Brazilian Cocoa, or simply as Guarana.

General Characters and Composition.—Guarana, or Brazilian Cocoa, is usually found in commerce in globular masses, or more frequently in irregularly cylindrical rolls of from five to eight inches long, and commonly about a pound in weight. These masses are very hard and dry, with an uneven surface, and dark reddish-brown colour. Guarana is also sometimes seen in a powdered state. It has an astringent, somewhat bitter taste, and an odour which reminds one of chocolate, to which generally it bears some resemblance, but it is less oily than that substance.

Martius first detected in Guarana a crystalline principle which he named *guaranin*, and which subsequent chemists have proved to be identical with *thein* or *caffein*, the active principle of China tea, Coffee, and Paraguay tea. Thein has therefore been found in four different substances derived from plants of four different natural orders, and which have been used from the earliest periods in the preparation of unfermented beverages in different parts of the world. This discovery is one of the most interesting facts which modern chemistry has made known to us. The investigations of Stenhouse also prove that guarana contains more *thein* than either of the other substances yielding it; thus guarana yields 5·07 per cent., good black tea 2·13, coffee from 0·80 to 1·00, and Paraguay tea 1·2 per cent. Thein has also been found by Daniell and Attfield, in Kola-nuts, the seeds of *Sterculia* (*Cola*) *acuminata*. Besides *thein*, guarana also contains *saponin*, *tannic acid*, an *acrid green fixed oil*, and three *volatile oils*.

Medical Properties and Uses.—The properties of guarana are but imperfectly known; it has been regarded as tonic, febrifugal, nutritive, aphrodisiac, and to some extent narcotic. Its action on the nervous system is probably analogous to that of tea and coffee, acting as a restorative and nervous stimulant. In Brazil guarana is considered to be prophylactic as well as curative; and is used

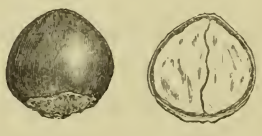
both as a remedial agent and for the preparation of a most refreshing as well as nutritive beverage. It is also frequently mixed with articles of diet, as cassava. The beverage is commonly prepared by adding about a teaspoonful of guarana to a glass or cupful of sweetened water; it is said that travellers in Brazil commonly carry it with them, and use it as a substitute for tea.

As a medicine it has been highly recommended in diarrhœa, nervous headache, neuralgia, paralysis, irritation of the urinary passages, and various other affections. But the results obtained by its use in this country are at present very conflicting. It may be administered in substance, or in the form of a beverage as above, or mixed with chocolate, or probably, as alcohol is said to extract all its virtues, the best form of administration would be as an alcoholic extract. It should not be employed in cases where there is a determination of blood to the head, or in plethoric conditions of the bowels.

Martius, in Buchner's Report d. Pharm., xxxi (1829), p. 370; Gavrelle sur une nouvelle Substance Médicinale, Paris, 1829; Mart., Mat. Med. Brazil, p. 59, 1843; Fournier, in Journ. de Pharm., ser. 2, xxxix, p. 291; Hooker's Lond. Jl. Bot. (1851), p. 194; Ritchie, in Monthly Journ. Med. Science, 1852, p. 465; Ph. Jl., vol. xvi, ser. 1, p. 213; U. S. Disp., by W. & B., p. 1670.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected by Spruce near the Rio Uaupès, Brazil, in 1852-3 (no. 2055). A leaf and flower-panicle. 1. Vertical section of flower. 2. A petal. 3. Vertical section of the same to show the appendage. 4. Fruit. 5. A fruit with one valve removed to show the seed. This specimen was of somewhat unusual form; the usual shape of the seed is shown in the woodcuts below. (1—3 enlarged.)



E Blair FLS ad nat del et lith

M & N Hanhart imp

PISTACIA LENTISCUS, *Linn.*

N. Ord. ANACARDIACEÆ. Lindl., Veg. Kingd., p. 465; Le Maout & Dec., p. 360; Baill., Hist. Plant., v (*Terebinthaceæ*).

Tribe *Anacardieæ*.

Genus **Pistacia**,* *Linn.* B. & H., Gen., i, p. 419; Baill., l. c., p. 322. Species 6, natives of the Mediterranean, Asia Minor, Canary Islands and Mexico.

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68. Pistacia Lentiscus,† *Linn., Sp. Plant., ed.* 1, *p.* 1026 (1753).

Lentisk. Mastic-Tree.

Figures.—Woodville, t. 11; Nees, t. 351; Steph. & Ch., t. 130; Hayne, xiii, t. 20; Berg & Sch., t. 27 f; Flora Græca, t. 957; Bot. Mag., t. 1967.

Description.—A shrub or small tree scarcely reaching above 12 feet in height, much branched; bark smooth, brownish-grey. Leaves alternate, without stipules, stalked, evergreen, pinnate; the rachis bordered on either side with a narrow leafy wing; leaflets opposite, in 3—5 pairs and occasionally a terminal one, sessile, articulated with the rachis, ovate-oblong, often unsymmetrical, narrow below, subacute and shortly mucronate at the apex, entire, smooth, thick, dark green above, paler beneath, red when young; the rachis red above. Flowers very small, unisexual, diœcious, very shortly stalked, irregularly and rather laxly arranged in short, erect, stalked, axillary racemes which are scarcely 1 inch long, solitary or two or three together in the axils of the leaves. Male flowers:—Calyx small, deeply cut into 5 broad, triangular, acute teeth, smooth; petals none; stamens 5, opposite the sepals, filaments very short, anthers large, erect, much exceeding the calyx, 2-celled, slightly apiculate, brownish-yellow; pistil rudimentary. Female flowers:—Calyx deeply cut into 3 or 4 triangular acute teeth; petals and stamens none; ovary globose, as long as the calyx, smooth, 1-celled, with a single erect ovule, style 3-fid to the base, stigmas flat, broad, spreading. Fruit a small, roundish-compressed or obovate drupe about $\frac{1}{4}$ inch in diameter, with a faint

* *Pistacia*, πιστάκια of Dioscorides, the name of the fruit of *P. vera*, Linn.

† *Lentiscus*, the classical name of the plant.

apiculus, often unequal-sided, smooth, orange-red, pulp dry, scanty, endocarp thin, very hard. Seed solitary, ascending, with a membranous testa; cotyledons large, plane-convex; radicle accumbent; no endosperm.

Habitat.—This shrub has a wide distribution in the Mediterranean region, being found growing in dry stony places in Spain, Portugal, Morocco, the south of France, Italy, Greece, Turkey, the various islands of the Mediterranean, and Syria. It also extends to the Canary Islands, and specimens have been brought from Somali-land, in tropical Africa, by Hildebrandt, where it forms a large tree and is called "Hess." The Lentisk has been cultivated in the island of Scio for several centuries, and the trees there are said to be entirely male. Specimens were in cultivation in England so far back as 1664, and it is now to be found in all botanic gardens, where it flowers in April and May, when the young leaves appear.

DC. Prod., ii, p. 65; Boiss., Fl. Orient., ii, p. 8; Unger & Kotschy, Die Insel Cypern, p. 419; Gren. & Godron., Fl. France, i, p. 339; Lindl., Fl. Med., p. 288.

Official Part and Name.—MASTICHE; a resinous exudation obtained by incision from the stem (B. P.). The resinous exudation obtained from the stem by incision (I. P.). MASTICHE; the concrete resinous exudation (U. S. P.).

Collection and Commerce.—Mastich is exclusively collected in the northern part of the island of Scio, and from male plants only; but from experiments made by Orphanides, it seems clear that it could also be readily obtained in other islands of the Grecian Archipelago, and even probably in Continental Greece itself. It is principally exported from Scio to Constantinople and other parts of Turkey; but also to Trieste, Marseilles, and Vienna, and to a limited extent to England and elsewhere.

Mastich or Mastic is principally obtained from the bark of the stem and large branches after incision; but some of very fine quality also exudes spontaneously from the small branches. Formerly the incisions were made transversely, but now they are made vertically and close together, and in a short time afterwards

the juice exudes and soon hardens and dries on the bark ; or it runs down to the ground, which is kept clean and firm around the stems of the trees on that account, or flat pieces of stone are sometimes placed there to preserve the mastich still more carefully from dirt. The mastich which dries on the stems is commonly in separate tears, whilst that on the ground is usually in irregular masses of more or less agglutinated tears. In from 15 to 20 days the mastich is sufficiently hard to collect, which operation is conducted with great care, the mastich being placed in small baskets lined with clean cotton wool or white paper. A healthy plant will yield from 8 to 10 pounds of mastich. The operations, which are performed by women and children, usually commence about the middle of June, and last for two months.

General Characters, Varieties, and Composition.—The best mastich occurs in roundish tears about the size of a small pea, or in more or less flattened, or irregular oblong or pear-shaped pieces ; which are externally covered with a light whitish powder from their mutual attrition. The tears have a pale yellow colour, which darkens by age ; they are somewhat opaque on their surface owing to the dust with which they are covered, but are quite transparent in their interior ; they are brittle, and break with a conchoidal vitreous fracture. Of late years the tears of mastich have been usually imported after being washed, so that they are no longer dusty and somewhat opaque on their surface, but have a glassy transparent appearance. Mastich has an agreeable, balsamic, terebinthinous odour, especially when rubbed or heated. It has a mild resinous taste, and when chewed becomes soft and ductile, so that it may be readily masticated and kneaded between the teeth. This latter character enables us readily to distinguish between it and the resin called Sandarach, derived from *Callitris quadrivalvis*, Vent., to which it has much resemblance, but which, when bitten, breaks to powder. The specific gravity of mastich is about 1·065; it softens at a temperature of about 210°, and melts at 226°. It is wholly soluble in ether.

Inferior mastich either occurs in separate tears, or more frequently in irregularly-shaped masses composed of agglutinated tears. It

is darker coloured and less transparent than the better qualities of mastich; and is usually contaminated with earthy matters, fragments of bark, and other vegetable impurities. According to Heldreich and Orphanides, the dealers in Scio distinguish three or four qualities of mastich, the best of which goes to Constantinople.

Mastich consists of a minute proportion of *volatile oil*, about 90 per cent. of *resin soluble in alcohol and ether*, and 10 per cent. of a *resin insoluble in alcohol*. The soluble resin is termed *Alpha-resin of Mastich*, or from its possessing acid properties *Masticic acid;* the resin insoluble in alcohol is called *Beta resin of Mastich* or *Masticin*. Masticin is a colourless, translucent, tough substance; insoluble in alcohol, but soluble in ether and oil of turpentine.

Adulterations and other Kinds of Mastich.—Mastich is but rarely adulterated, although occasionally it is said, with Sandarach, Olibanum, and other resinous substances. According to Landerer, the gummy exudation from *Atractylis gummifera*, L., is also used to some extent to adulterate mastich. It is known in Greece as *Mastix-ankathi;* and is also sold for chewing under the names of *pseudo-mastich* and *acantho-mastich*. When used as an adulterant its tears are coated with finely powdered mastich, under which condition they closely resemble in appearance true mastich; but are readily detected by their insolubility in alcohol.

Besides the official mastich, other species of *Pistacia* yield analogous resins, the more important of which is the one known in the bazaars of India under the name of *Mustagi-rúmí* (Roman mastich), and by Persian writers as *Kúndarún* or *Sakir-shirin* (Sweet Mastich), the true mastich being there termed *Kúndar-rúmí* or *Sakir-rúmí*. This kind of mastich is the produce of *Pistacia Khinjuk*, Stocks, and *P. cabulica*, Stocks. It is imported into India from Cabul, and when of good quality very much resembles the official mastich. It is rarely imported into Europe under the name of *Bombay* or *East Indian Mastich*. The species of *Pistacia* which is found in Algeria as *Pistacia atlantica*, Desf., also yields a solid resin, which is used in place of mastich by the Arab tribes of Northern Africa.

Medical Properties and Uses.—Mastich possesses stimulant and diuretic properties, like the ordinary coniferous turpentines. It was formerly much employed in medicine; but its use as an internal remedy has now become almost obsolete iu Europe and the United States. In the East, however, Landerer states, that a decoction of mastich is still extensively employed in infantile diarrhœa. Cotton wool saturated with an alcoholic or ethereal solution of mastich is also sometimes applied with advantage to the cavity of a carious tooth to relieve toothache.

The principal use of mastich in this country and the United States is as a stopping for carious teeth; and when dissolved in alcohol or oil of turpentine as a varnish. But its use for the latter purpose is much less than formerly, its place being in a great degree supplied by dammar and other less expensive resins.

The great consumption of mastich is at Constantinople and in the East, where it is used as a masticatory for the purpose of sweetening the breath, and under the impression that it preserves the teeth and gums. In the East it is also employed to some extent for fumigation; and in the manufacture of confections and cordials.

Steph. & Church., Med. Bot., by Burnett, vol. iii, pl. 130; Per. Mat. Med., by B. & R., p. 880; Pharmacopœia of India, p. 58; Pharmacographia, p. 142; U. S. Disp., by W. & B., p. 553; Watts' Dict. Chem., vol. iii, p. 857; Tournefort, Voyage into the Levant, vol. ii (1741), p. 60; Powell, Economic Products of the Punjaub, p. 411; Guibourt, Hist. des Drogues, vol. iii (1850), p. 458; Landerer, in Pharm. Journ., vol. vi, ser. 3, p. 496; Proc. Amer. Pharm. Assoc., vol. xxiii, p. 167, and vol. xxiv, p. 141; Amer. Journ. of Pharm., May, 1876, p. 195.

DESCRIPTION OF PLATE.

Drawn from specimens collected in Tuscany, in the British Museum. 1. Branch of a male tree in blossom. 2. A male flower. 3. Section of the same. 4. Raceme of female flowers. 5. A female flower. 6. Section of the same. 7, 8. Fruit. 9. Vertical section of the same. (2, 3, 5, 6, 8, 9 enlarged.)

D.Blair F.L.S. ad. nat. del. et lith.

M & N Hanhart imp.

PISTACIA TEREBINTHUS, *Linn.*

N. Ord. ANACARDIACEÆ.
Tribe *Anacardieæ*.
Genus Pistacia, *Linn.*

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69. Pistacia Terebinthus,* *Linn., Sp. Plant., ed.* 1, *p.* 1025 (1753).

Figures.—Woodville, t. 12; Nees, t. 352; Steph. & Ch., t. 129; Hayne, xiii, t. 19; Flora Græca, t. 956.

Description.—Usually a small tree, but occasionally reaching a height of 40 feet, or on the other hand forming a mere bush, much and irregularly branched; bark purplish-grey, rather smooth. Leaves alternate, without stipules, stalked, reaching 6 inches in length, deciduous, pinnate, leaflets alternate or sub-opposite, 2—4 on either side of the rachis and a larger terminal one, nearly sessile, oblong-oval or broadly oval when full grown, rounded at the base, acute or obtuse at the apex, entire, smooth, dark green above, paler and minutely veined beneath, when young thin, shining, and strongly tinged with reddish-purple. Flowers very small, numerous, unisexual, dicœcious, shortly stalked, arranged rather laxly on the branches of stalked panicles 2 or 6 inches long from the axils of the scars of the leaves of the previous year; bracts large, woolly, soon deciduous. Male flowers:—Calyx very deeply cut into 5 setaceous segments, petals none, stamens as in *P. Lentiscus*, pale yellow. *Female flowers*:—Calyx very deeply divided into 3—6 linear setaceous membranous segments; pistil as in the last. Fruit much as in *P. Lentiscus*, but slightly larger, bright red, pulp very scanty. Seed as in the last, embryo green, no endosperm.

Habitat.—This tree is found wild commonly in the south of Europe, extending further to the north than *P. Lentiscus* in France and Italy; it occurs throughout the Mediterranean district, and, if we follow Hanbury and include in it *P. atlantica*, Desf., *P. palæstina*, Boiss., and *P. cabulica*, Stocks, it is found under slightly different varieties, in the Canaries, Northern Africa, Syria, and eastward to Afghanistan. It was long ago

* *Terebinthus*, τερέβινθος, or τέρμινθος; the classical name.

cultivated in England, and grows very well in gardens in this country. The good figure in Steph. and Church. quoted above was made from a fine female tree in the Apothecaries' Garden at Chelsea, which has, however, long been lost.

It is probable that the Pistachio, *P. vera*, Linn., cultivated in the south and west of Europe for its fruit (seed), may be but a cultivated race of this introduced into Europe from the East in past times. It is not known in a wild state.

DC. Prod., ii, p. 64; Boiss., Fl. Orient., ii, p. 6; Gren. & Godr., Fl. France, i, p. 339; Lindl., Fl. Medica, p. 288; Flück. & Hanb., Pharmacogr., p. 146.

Part Used and Names.—Terebinthina Chia; a liquid oleo-resinous exudation obtained by incision from the stem. It is not official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United States; but it was formerly recognised in the London, Edinburgh, and Dublin Pharmacopœias. It is commonly known as *Chian, Scio,* or *Cyprus Turpentine.*

Production and Collection.—The Chian turpentine of commerce, like mastich, is exclusively obtained from the island of Scio, where it exudes from the trees to some extent spontaneously; but it is produced more abundantly after incisions made in their trunk and branches in the spring, and from which the oleo-resin continues to flow during the whole summer. It is in the morning, says Levrault, after the coolness of the night has somewhat solidified the exudation, that it is scraped from the stem down which it has flowed, and from the flat stones placed at the foot of the tree to receive it. When thus collected it is always mixed with some foreign matters, it is therefore purified by straining through small baskets, after having been liquefied by exposure to the heat of the sun. As the produce is very small, a large tree only yielding ten or eleven ounces in the course of the year, Chian turpentine is dear even in the island of Scio where it is collected. Maltass, when writing on this substance in 1858, says from information communicated to him by Dr. Barbieri, of Scio,

that the trade at that time was exclusively in the hands of Jews, who disposed of it in the interior of the Turkish empire. But very little is forwarded to Great Britain or to other parts of Europe, or to the United States. The whole produce of the island has been roughly estimated at about 850 lbs annually.

General Characters and Composition.—Chian turpentine when pure and fresh is a transparent liquid, about the consistence of honey, but more tenacious, of a greenish-yellow or yellowish-brown colour; and with an agreeable, mild terebinthinous odour, and but little taste. By keeping it hardens from the loss of volatile oil, and acquires a somewhat less pleasant odour. Chian turpentine is entirely soluble in alcohol, the solution being according to Flückiger and Hanbury, very slightly fluorescent, and reddening litmus.

Chian turpentine consists of *resin* and *volatile oil.* The volatile oil occurs in the proportion of about 14½ per cent. according to the authors of Pharmacographia, who describe it as having the composition of oil of turpentine, the odour of the drug, of sp. gr. 0·869, a boiling point of about 322°, and as dextrogyrate. The resin appears to be identical with the *Alpha-resin* of mastich, as it is entirely soluble in alcohol like it.

Adulteration.—From its scarcity and consequent high price, Chian turpentine is commonly adulterated with the coniferous turpentines, or they are altogether substituted for it.

Medical Properties and Uses.—Chian turpentine has the stimulant and diuretic properties of the coniferous turpentines; and was formerly used for the same purposes, but as a medicine it is now obsolete.

It is said to be used in Greece for mixing in small proportions with wine, in order to preserve it, especially when it has to be shipped. It is likewise used for the purpose of flavouring a cordial called *raki,* which also contains aniseed, and is extensively consumed in all parts of the Levant. Other cordials as well as wine are also flavoured with it. We have already indicated that mastich is used for a similar purpose in Greece; and the turpentine of some Coniferæ is also employed in a like manner.

Per. Mat. Med., vol. ii, pt. 2, p. 376; Pharmacographia, p. 146; U. S. Disp., by W. & B., p. 866; Steph. & Church., Med. Bot., by Burnett, vol. iii, pl. 129; Tournefort, Voyage into the Levant, Lond. (1741), vol. ii, p. 62; Maltass., in Pharm. Journ., vol. xvii, ser. i, p. 541.

DESCRIPTION OF PLATE.

Drawn from specimens in the British Museum collected in the south of France.

1. Twig of male tree in flower.
2. A male flower.
3, 4. Stamens.
5. Branch of female plant in flower.
6. Female flower.
7. Pistil.
8. Section of ovary.
9. Bunch of fruit.
10. A single drupe.
11. Section of the same.
12. A fully grown leaf.

(2–4, 6–8, 11 enlarged.

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